ORIGINAL RESEARCH ARTICLE

Role of Tens Therapy in Neuropathic Pain

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ABSTRACT

Pain is an unpleasant sensory & emotional experience associated with tissue damage, while neuropathic pain results from tissue damage in central and peripheral nervous system. The application of electrical current through the skin can be used for pain control by Transcutaneous Electrical Nerve Stimulation (TENS) unit that is known to produce neuro-modulation by pre synaptic inhibition, endogenous pain control or restoration of afferent input. We want to evaluate the profound effects of TENS therapy among patients with crucial neuropathic pain symptoms methodology base line histories, location & types of neuropathic pain symptoms such as numbness, tingling, burning, paresthesia and lancinating pain were checked of pain while intensity of pain was also determined by using numeric rating scale both in pre & post TENS therapy. The results showed that pain symptoms among the population with neuropathic pain have remarkably reduced after the application of TENS. By using verbal pain scale chart it has been determined that the crucial neuropathic pain symptoms have been reduced by the application of TENS. These results suggest that TENS reduced pain symptoms during peripheral neuropathy this reduction in pain symptoms support the hypothesis that TENS work through reducing hyperalgesia.

Keywords: Pain intensity, Neuropathic pain, TENS, pain, neuropathy.

INTRODUCTION

Any sensory and emotional distasteful experience is recognized as Pain that can appear as symptom of actual or possible tissue damage due to any injury or disease (McCaffery, 1968 & Pasero et al., 1999 & Richiemer, 2002). If this involves smash up to either the central nervous system (CNS) or the peripheral nervous system (PNS), results in Neuropathic pain that is characterized by burning, electric, tingling and shooting sensations (Bauman, 2002 & Macreset al., 2002). The key causes like confiscation, diabetes and other tribulations often results in numbness, dyesthesias, hyperesthesia, hyperalgesia, allodynia astypicalappearance of specifically neuropathic pain. Symptoms usually last even after improvement of the prime cause that may be due to frenzied sensitization of CNS, results in poor transmission of signals to spinal cord and brain. The major concern is not only poor control over healing and psychophysiological issues but also there are many limitations in bursting sensation in treatment options. Neuropathic pain syndromes can be further classified in the basis of contingent mechanisms (Portenoy, 1991) as compressive or entrapment neuropathies, plexopathies, radiculopathies and polyneuropathies, other relates problems of in the spinal cord, brain or both. Many of the neurophysiologic, neuroanatomic changes that may occur in neuropathic pain are understood (Gamsa, 1994). Transcutaneous Electrical Nerve Stimulation (TENS) has been clearly recognized as a purposeful method of pain management by non invasive electrostimulation (Lampe, 1978 & Cameron, 2003). It is postulated that this stimulation lessen pain intensity and feel in all physiologically related parts of body (Ellis, 1998), though mainly it has been used for pain management it is necessary to analyze its analgesic role of and comparison of pain intensities in relation to different characteristic symptoms of pain. (Lazarou et al., 2009). There are various studies and case reports have been discussed that emphasizes the clinical utilization of TENS for a range painful conditions as low back pain (LBP), joint pain, neuropathic...
TENS is reported to produce neuromodulation by causing inhibition at presynaptic level and contributes to relieve endogenous pain by facilitating the release of endorphin family (Basbaum AI, Fields HL, 1978), in CNS. Moreover elevated rate of TENS lessen excitation of CNS neurons to spread pain sensation by trimming down glutamate and amplifying GABA release in the spinal cord that leads to the analgesic effect via muscarinic receptors. TENS at much lower frequency help to activate serotonin receptors in the spinal cord facilitates GABA. In painkilling clinical approaches, TENS is much likeable technique to be used in an to lessen neuropathic pain (Forst, et al. 2004). Mixed reviews and opinions have been reported by patients and practitioners about advantages of this approach, vary on individual basis (L. S. Chesterton, et al, 2003), and pain threshold (Foster, et al, 2003). It is found to be very useful in in labour (Spank, et al. 2000); knee pain (Ng, et al, 2003), (Cheing, et al, 2003) (Osiri, et al, 2000); bladder post operative pain (Kararmaz, et al, 2004); limb pain (Cooney, 1997).

MATERIAL AND METHODS
The patients were diagnosed with different types of peripheral neuropathy such as Right lumber reticulopathy, carpel tunnel syndrome, Vitamin B₁₂ deficiency neuropathy, radiculopathy, sciatic nerve compression, lumbosacral radiculopathy, dysfunction of median nerve. Base line history from all subject were collected through a questionnaire, which included question mainly on current health of the individual, complete history, location of pain, intensity of pain was determined by using Numeric Pain rating scale (Hartrick et al., 2003). Pain was measured on an 11-point numeric pain rating scale (VAS; scale range: 0, no pain; 10, worse possible pain). The principal TENS efficiency determinant was the reduction in neuropathic pain scores at first follow-up visit in comparison with baseline scores. We observed purposely the most frequent pain symptom scores of numbness or tingling and burning.

NUMERIC RATING SCALE
Types of neuropathic pain, symptoms either, numbness, tingling, burning, paresthesia, lancinating, electrical shock like Pain Paroxysms (Jensen et al. 2001, Dworkin 2002, Hansson 2002, Sommer 2003). The aching pain is common in polyneuropathy (Otto et al., 2003) and central pain (Hansson, 2002). The presence of any psychological factor as depression and anxiety that are commonly associated with neuropathic pain was also noted. Moreover the patients were also questioned about the effects of pain on their daily routine.

APPLICATION OF TENS:
Despite of medications, neuropathic patients were also prescribed to TENS Therapy as an effective way to relieve pain. A transcutaneous electrical nerve stimulation (TENS) unit consists of 1 or more electrical-signal generators, a battery, and a set of electrodes. The TENS unit is small and programmable, and the generators can deliver trains of stimuli with variable current strengths, pulse rates, and pulse widths. The preferred waveform is biphasic, to avoid the electrolytic and iontophoretic effects of a unidirectional current (Peters K, et al. 2008). The settings for the stimulus parameters used clinically are the following:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplitude</td>
<td>Current at a comfortable, low intensity level, just above threshold</td>
</tr>
<tr>
<td>Pulse width (duration)</td>
<td>120-160µsec (vary)</td>
</tr>
<tr>
<td>Pulse rate (frequency)</td>
<td>4-6 Hz (vary)</td>
</tr>
</tbody>
</table>

RESULTS
Table 1: The Table showing appearance of Pain symptoms in patients with Neuropathic pain before and after Transcutaneous Electrostimulation

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Pre-TENS</th>
<th>Post-TENS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tingling</td>
<td>66%</td>
<td>38%</td>
</tr>
<tr>
<td>Burning</td>
<td>70%</td>
<td>44%</td>
</tr>
<tr>
<td>Deep pain</td>
<td>25%</td>
<td>20%</td>
</tr>
<tr>
<td>Restless legs</td>
<td>24%</td>
<td>7%</td>
</tr>
<tr>
<td>Numbness</td>
<td>54%</td>
<td>34%</td>
</tr>
<tr>
<td>Lancinating</td>
<td>8%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Pain symptoms among the population with neuropathic pain have remarkably reduced after the application of TENS that evident in (Table 1). There is a noticeable change in patients reported for burning, tingling, restless legs & numbness.
While the other symptoms like deep pain & lancinating pain did not show any significant improvement.

![Graph Showing the Comparison of Pain Symptoms between Pre and Post Tens Groups](image1)

**Fig 1:** Graph Showing the Comparison of Pain Symptoms between Pre and Post Tens Groups

![Graph Showing the Comparison of Pain Symptoms between Pre and Post Tens Groups With the Help of Pain Scores](image2)

**Fig 2:** Graph Showing the Comparison of Pain Symptoms between Pre and Post Tens Groups With the Help of Pain Scores

DISCUSSION

Pain in general includes a variety of sensations, involving the nerves and the brain, ranging from agony to numbness. Unusual sensations such as tingling, burning, or "pins-and-needles" type pain considered as paresthesias. They usually result from nerve damage due to pressure (such as a pinched nerve), entrapment, or diseases. Burning, numbness, shooting pain. Continued nerve damage can lead to numbness, dysesthesia (eg, burning, tingling), and signs of nerve injury detected during neurologic examination. TENS is a passive, non-invasive, non-addictive modality with no acknowledged side effects used clinically by a variety of health care professionals for the reduction of pain (Sluka, 2003). TENS works to decrease pain perception and can be useful to control acute and chronic pain. It may also be used with other treatments such as exercise and other effects. A session typically lasts from 5 to 15 minutes and treatments may be applied as often as necessary, depending on the severity of pain. Some practitioners refer to TENS as a sort of "electrical massage" (Internet, 2009).


Recent data suggest pain relief from low and high frequency TENS is mediated by the release of mu or delta-opioids, respectively, in the central nervous system (Chandran, et al. 2003 & Sluka, et al. 2002), and reductions in substance P (Rokugo, et al. 2002). Theories used traditionally to explain acupuncture have also been offered, citing effects on flow of vital energy. It is also sometimes suggested that TENS may affect the cardiovascular system, increasing heart rate and reducing blood pressure (Campbell, et al. 2002). The low-frequency TENS treatment was effective in improving the viability of ischemic skin flap (Liebano, 2008).

In our study we tested the effectiveness of episodic transcutaneous electrical nerve stimulation (TENS) on pain symptoms in patients with neuropathic pain. TENS, with a modulated frequency, intensity as high as the subject could tolerate, and electrodes placed over the painful area. Self-report of pain symptoms were assessed on 448 subjects. TENS resulted in significantly less tingling, burning, restless legs and numbness in post TENS groups as compared to pre TENS groups (Table 1). Variations in the involvement of unmyelinated and myelinated nerve fibres that generate pain sensations of burning, tingling, numbness etc. alter with respect to known & mysterious pathophysiological findings in intensities as well as in quality and characteristic signs as superficial, lancinating etc. Although deep pain and lancinating were not significantly different when compared with pre TENS groups. These results suggest TENS
reduces pain symptoms during peripheral neuropathy and maintain quality of life when used as a supplement to pharmacologic analgesia. Reduction in pain symptoms support the hypothesis that TENS works through reducing hyperalgesia. Quantifying the intensity of pain is an essential part of initial and ongoing pain assessment. A variety of validated pain scales are available to assist in the measurement of pain. Whichever method is chosen, it should be systematically applied (Au et al. 1994). Pain measurement tools include simple one-dimensional scales or multidimensional questionnaires. Pain measurement should include both the time-frame and the clinical context of the pain (Chapman et al. 1985). In our study patients were asked about their pain at the time of assessment and the average intensity over a fixed period of time in order to analyze the course of the pain, it useful to inquire about pain as separate measures for pain “on average”, “at its worst”, and pain “at its least”. The Commonly used unidimensional scales: Verbal Rating Scale (VRS), the Numeric Rating Scale (NRS), a Visual Analog Scale (VAS), and a Pictorial Scale was used. Transcutaneous electrical nerve stimulation (TENS) is an effective adjunctive therapy for neuropathic pain; however, effects of different frequencies of stimulation have not been systematically investigated. Peripheral Neuropathy causes significant neuropathic pain among the patients and requires substantial medication. Therefore, we studied the effects of TENS regarding intensity of pain in peripheral neuropathic pain patients. 448 patients suffering from peripheral neuropathies were randomly allocated to receive TENS. Peripheral neuropathic pain was evaluated using a standard numeric rating scale and through a questionnaire, both high frequency and low frequency TENS, at strong, but comfortable sensory intensity, were applied for 15 to 30 minutes. Pain was assessed before and after application of TENS when patients were at physiotherapy centre. By considering the pain symptoms it has been concluded that both high and low frequency TENS significantly decreased intensity of pain when Pre-TENS groups using the numeric rating scale (P=0.001) compared to the Post-TENS groups (P=0.001) (table-3). TENS in combination with pre and post investigation is found not only as a harmless, low-cost, and easy to do procedure that provides pain. Our TENS study concluded that changes in intensity of pain can be varied with different etiologies but it could be directly bridging the gap of sufferings and cure. Though there was certain limitations as sample size that could be sufficiently large to spot significant differences in lessening of pain intensity, and any sensible design enhances the generalize ability of our findings to primary care, making efforts to standardize care in accordance with general practice. Pain intensity can be used as a fundamental sequence of symptoms to evaluate pain The pain intensity–related information association with evaluation of features of a painful stimulus. We propose that intensity processing is both a critical precursor and an integral component of the many processes comprising the pain experience (Table: 1). Such processes include evaluation provides a neurophysiological basis for the high degree of covariance between discrete aspects of the pain experience and perceived pain intensity. On a conclusive note of our findings is unlikely to exist for all change of patient conditions, combined with interacting therapeutic modalities, an evidence-based approach to pain management is not always possible or beneficial to the patient. In the face of inconclusive evidence, a theory-based approach may help determine if the therapeutic effect of a given physical agent has the possibility of being a useful clinical tool in the context of treating a particular patient’s mechanism of pain generation. Until controlled efficacy findings are definitive, careful individual patient response monitoring of thoughtful theoretical application of adjunctive physical agents may be a prudent approach to the management of chronic pain. Future studies are needed to identify the optimal time to achieve maximum antinociceptive effect and to confirm and extend these results. Additional search for biologic markers (i.e, epidermal nerve fiber biopsy, microneurography) will be necessary in future protocols to determine if permanent structural changes can be produced.

REFERENCES

tibial nerve stimulation (PTNS). *Neurourol Urodyn.*