

EFFECTS OF TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (TENS) ON PATIENTS WITH ACUTE LOW BACK PAIN

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Abstract

Background: Acute low back pain (LBP) affects a significant proportion of the population. Transcutaneous electrical nerve stimulation (TENS) was introduced more than 30 years ago as an adjunct to the pharmacological management of pain. However, despite its widespread use, the usefulness of TENS in LBP is still controversial.

Introduction: LBP is a common problem in Bangladesh. Acute LBP is usually defined by a period of complaints of LBP of six weeks or shorter. TENS may improve acute LBP.

Objective: To evaluate the effectiveness of TENS on acute LBP and also to ensure the patients wellbeing by shortening recovery time who have acute LBP.

Methods: A prospective study was carried out in the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from July 2008 to December 2008. The patients were divided into two groups (A and B). Patients of Group A (30 patients) were treated with TENS, Non-steroidal anti-inflammatory drugs (NSAIDs) and activities of daily living (ADLs) instruction. Patients of group B (28 patients) were treated with NSAIDs and ADLs instructions.

Results: A total of 58 Patients of acute LBP were included in this study. The mean age of the patients was 38.5 ± 9.01 years. Main causes of pain were muscle strain (39.65%), nonspecific LBP (22.41%), prolapsed lumbar intervertebral disc (17.24%), lumbar spondylosis (13.79%) and sciatica (6.91%). After treatment the result was compared and student's 't' test was done to see the level of significance. Method was found significant after treatment ($p < 0.05$). Twenty four (80%) patients were improved in group A and 18 (64.28%) patients in group B. Patient compliances of group A were better than that in group B.

Conclusion: Effect of TENS on patients with acute low back pain is beneficial.

Keywords: Transcutaneous electrical nerve stimulation (TENS), acute low back pain (LBP)

Introduction

Acute low back pain is the fifth most common reason for all physician visits¹. Acute LBP is usually defined by a period of complaints (LBP) of six weeks or shorter². Low back pain is the most common reason that adults seek out patients' physical therapy³. Low back pain is an uncomfortable sensation in the lumbar and buttock region originated from neurons near or around the spinal canal that are injured or irritated by one or more pathologic process⁴. In United State approximately 90% of persons in the working population have back pain every year⁵. In United Kingdom back pain is the second most common cause of physical disability after cardiovascular disease⁵. Even in Bangladesh it is the commonest cause of disability. Causes of Acute LBP are due to back strain, acute disc herniation, osteoarthritis, spinal stenosis, spondylololsthesis, ankylosing spondylitis, infection and malignancy⁶. In case of acute LBP 5-10% of cases become chronic⁷. The impact of surgery on the management of acute LBP is low⁸. For the majority of non surgical patients, activity modification, analgesics, muscle relaxant, education, spinal manipulation therapy and epidural injections are recommended to shorten recovery time and as symptomatic therapy⁹. In contrast with these well established concepts TENS therapy can be used in the management of acute LBP. For, TENS is the appropriate treatment for acute and chronic low back pain which can not be treated less expensively, more safely or more effectively by other means¹⁰. For more than four decades TENS has been applied in the treatment of acute and chronic pain syndrome^{11,12}. Role of other therapeutic modality (Short wave diathermy, ultrasound therapy) in management of LBP in aspect of our country has been studied, which are not sufficient enough in management

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of acute LBP and no such study has done yet in role of electrotherapy (TENS) on evaluation of acute LBP in our country. The aim of this study is to evaluate the effectiveness of TENS on acute LBP which is a very common problem in day to day practices and also to establish TENS as a treatment modality along the conventional one. To ensure the patients' wellbeing by shortening recovery time, who have acute LBP and they can get back to their active state of life as soon as possible.

Materials and Methods

This prospective randomized study was carried out in the Department of Physical Medicine and Rehabilitation (PM&R), Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka from July 2008 to December 2008. Patients having acute LBP were selected from the Department of PM&R, who were referred from various out patients Department of BSMMU and also from general practitioners outside the Hospital. On arrival at the Department detailed history was taken and clinical examination and necessary investigations were carried out properly. Seventy patients were selected for this study according to the following criteria.

Inclusion criteria

- Patients of both sexes of aged between 20-60 years
- Patients having LBP for 6 weeks or less
- No current treatments has been used for pain medications (as prescribed by the physician)
- Patients who are able to complete the questionnaire

Exclusion criteria

- Pain duration more than 06 weeks
- Patients with any inflammatory low back pain
- Patient with other complications like cauda equina syndrome, caries spine, malignancy, pregnant women
- Patients with cardiac pace maker

Patients in group-A were treated with TENS, NSAIDs and Instructions of Activities of daily living (ADL). Patients in group-B were treated with NSAIDs and ADL instructions. Patients in group A were treated with low frequency (0.5 to 10 Hz) high intensity TENS for 30 minutes for consecutive 15 days. The electrodes were placed paravertebrally at the low back region.

Melzack & Wall described the "Gate control theory"; according to that (a) Cells within the substantia gelatinosa are stimulated by both small diameter nociceptive and large diameter sensory neurons; (b) these cells serve as gate by inhibiting the relaying of nociceptive information to the brain if non painful sensory stimuli present. Low frequency-high intensity TENS stimulate central nervous system (CNS) to secrete body's own natural morphine like substances known as endorphin. These endorphins work as similar manner to conventional narcotics to provide the body with overall pain relief. It also raises the pain threshold level¹⁰.

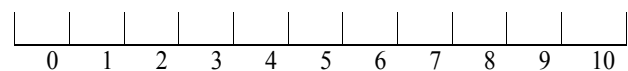
Aceclofenac (100 mg) was given twice daily after meal along with Capsule Omeprazole (20 mg) twice daily before meal for gastrointestinal support for fifteen consecutive days. ADLs were advocated verbally and some of them were physically demonstrated to all patients when required. Those were to avoid prolonged standing, to avoid prolonged sitting, to use plain firm bed, to use soft single pillow, to lie down in supine position, to be cautious during get in and get out of bed, to use high commode, to have working surface of adequate height of 5-10 cm below the elbow, to avoid stooping, to use long levered cleaner during sweeping, to avoid tight fitting garments, to avoid high heeled shoes, to avoid weight lifting or to lift with caution to keep back straight during activity, to avoid twisting and to drive in a comfortable position with adequate height.

Measures of Variables

Demographic variables: Age, Sex, Occupation and Socio-economic condition

Outcome Measures:

- Subjective pain intensity¹³: No pain=0, Mild=1, Uncomfortable=2, Severe=3, Unbearable=4
- Visual Analogue Scale (VAS): VASs are 10 cm lines anchored at the ends by words that defined bounds of various pain dimensions. The patients were asked to place a vertical mark on the scale to indicate the level of intensity of his or her pain¹³.



No pain=0 Maximum intensity of pain=10

- Tenderness Index¹⁴ : 0=No pain, I=Describes pain, 2= Patient winces, 3=Patient winces and withdraw the affected part, 4= The patient will not allow the joint to be touched
- Disability due to pain¹⁴ : None=0, Slight=1, Moderate=2, Necessary aid=3, Dependence=4
- Spinal mobility Index¹⁵ : SLR = Straight Leg Raising LT = Left, RT = Right
 - Normal = 90°
 - Modified Schober's test : 6-7 cm = Normal
 - ≤ 5 cm indicative of organic spinal pathology

Patients were first examined at day 1 (pretreatment) and at day 15 (post treatment) follow up and the outcomes were recorded in the assessment data sheet. All the outcome assessment data were analyzed by using the computer. The numerical data were analyzed statistically by using the SPSS-package program (version-10) for windows. Student's 't' test was done to evaluate the level of significance. The results were expressed as mean ± standard deviation (SD) and p<0.05 was considered as the level of significance. All categorical data were expressed in percentage (%) and frequency (f).

Results

A total 70 patients of acute LBP were included in this study. But 12 patients were dropped out from the study because they could not attend or could not follow the instructions. So, total 58 patients followed the treatment. In group A 30 patients and in group B 28 patients were included. The mean age of the patients was 38.5 ± 9.01 years, mean weight of the patients was 62.18 ± 6.45 killogram. Mean duration of symptoms of the patients was 12.17 ± 5.11 days. In the present series maximum number (22 patients) belonged to age group 31-40 years (table-I). Male to female ratio of patient was 1.4:1. Though pin point diagnosis of the patients with acute LBP was difficult, it was tried to make a differential diagnosis. Among the study patients (n=58) 23 patients (39.65%) were diagnosed as muscle strain and other diagnoses are shown in Table-III.

Table-I: Distribution of the patients as per age group

Age group (in years)	Group-A f (%)	Group-B f (%)	Total f (%)
20-30	02 (6.67)	05 (17.86)	07 (12.08)
31-40	12 (40)	10 (35.71)	22 (37.93)
41-50	10 (33.3)	08 (28.57)	18 (31.03)
51-60	06 (20)	05 (17.86)	11 (18.96)
Total	30 (100)	28 (100)	58 (100)

Table-II: The Occupations of study population

Occupation	Group-A f (%)	Group-B f (%)	Total f (%)
Service holder	12 (40)	08 (28.57)	20 (34.48)
Day labourer	05 (16.67)	06 (21.43)	11 (18.96)
House wife	04 (13.33)	06 (21.43)	10 (17.24)
Student	05 (16.67)	04 (14.28)	09 (15.52)
Business man	03 (10)	02 (07.14)	05 (08.62)
Driver	00	02 (07.14)	02 (03.45)
Others	01 (3.33)	00	01 (1.72)
Total	30 (100)	28 (100)	58 (100)

Table-III: Distribution of patients according to diagnosis

Diagnosis	Group-A f (%)	Group-B f (%)	Total f (%)
Muscle strain	11 (36.67)	12 (42.86)	23 (39.66)
Non-specific	07 (23.33)	06 (21.43)	13 (22.41)
PLID	04 (13.33)	06 (21.43)	10 (17.24)
Lumbar spondylosis	05 (16.67)	03 (10.71)	08 (13.79)
Sciatica	03 (10)	01 (3.57)	04 (06.90)
Total	30 (100)	28 (100)	58 (100)

In the present study 37.5% patients were from poor class, 60.71% patients were from middle class and 1.79% patients were from rich class of socio-economic status. In the present series, intensity of pain in both the groups was similar before treatment according to criteria of pain

measurement scoring system. Mean values were nearly same in both the groups. There were no significant differences in pretreatment assessment scores between the groups. After consecutive 15 days of treatment, significant improvement of pain in low back region were observed in both the groups but more on group-A (Table-IV).

Table-IV: Comparative improvement between groups on 1st day (D₁) and 15th day (D₁₅)

Parameter	Group A (n=30) Mean±SD	Group B (n=28) Mean±SD	p value
Subject pain intensity			
Pretreatment score D ₁	3.15±0.48	3.27±0.66	0.503
Post treatment score D ₁₅	1.35±0.68	2.11±0.67	0.015
Pain score (VAS)			
Pretreatment score D ₁	7.15±0.75	7.11±0.83	0.880
Post treatment score D ₁₅	5.25±0.16	6.11±0.75	0.011
Tenderness index			
Pretreatment score D ₁	2.90±0.30	2.72±0.46	0.167
Post treatment score D ₁₅	1.30±1.08	1.88±0.58	0.047
Disability due to pain			
Pretreatment score D ₁	2.10±0.64	2.44±0.61	0.101
Post treatment score D ₁₅	0.90±0.71	1.61±0.50	0.001
Spinal SLR			
Pretreatment score D ₁	82.00±10.56	82.22±10.03	0.948
Post treatment score D ₁₅	85.50±7.59	86.66±8.40	0.656
Modified Schober's Test			
Pretreatment score D ₁	5.36±0.32	5.41±0.33	0.631
Post treatment score D ₁₅	5.49±0.26	5.45±0.32	0.679

Discussion

LBP is the commonest presentation of patients reported to the Out Patient Department (OPD) at PM&R of BSMMU. More than twenty nine thousand patients were treated from July 2008 to December 2008 in the Department of PM&R, BSMMU, Dhaka, Bangladesh. Among them LBP was the presenting symptoms in 30% cases and 75% of those patients suffering from acute LBP. The mean age of the present study group was 38.5 ± 9.01 years. Middle age patients were more susceptible to acute LBP. In a study conducted in IPGM&R, Moyoenuzzaman¹⁶, observed that 25.55% patients were suffering from LBP. In 2005 Shahadat¹⁷, found that among the total patients seen in Physical Medicine Rehabilitation Department, 20% presented with LBP. That means one fourth to one fifth of all patients was suffering from LBP. The percentage is increasing day by day. In present study male female ratio was 1.4:1; in another study done in BSMMU by Shahadat¹⁷ male female ratio was observed to be 1.33:1. In this series service holders (34.48%) were affected more followed by daily labourer (18.96%), housewives (17.24%), students (15.52%), business man (8.62%) and driver (3.46%). In other series, study by Shahadat¹⁷ found 1.9% housewives, 24.2% service holders, 12.1% students, 11% workers, 11% business men, and farmers 4.4%. Moyoenuzzaman¹⁶ observed 15% house wives, 24% students, 19% service holders, 13% farmers, 11% workers were affected. The

distribution of occupations was representative of the other local statistics. According to WHO technical LBP is common among occupation that requires prolonged standing. In the present series, 22 (39.65%) patients suffered from muscle strain, 13 (22.41%) patients from non specific LBP, prolapsed lumbar intervertebral disc in 10 (17.24%) cases, lumbar spondylosis in 8 (13.79%) cases and sciatica in 4 (6.91%) patients. In a study done by Shahadat¹⁷, 91 patients (68.1%) were diagnosed as non-specific LBP, 19.8% were lumbar spondylosis, 4.4% patients were unilateral sacralisation, 4.4% were PLID and 2.2% were spondylolisthesis.

In this study, subjective pain intensity¹³, visual analog scales¹³ and tenderness index¹⁴ were decrease in group A patients treated with TENS than group B patients. Disability due to pain¹⁴ was slight in patients treated with TENS. Modified Schober's test¹⁵ was <6 cm in all patients of group A & B. Subjective pain intensity, visual analog scales, tenderness index and disability due to pain in the post treatment for group A and B were significantly ($p<0.05$) better than pretreatment. In another study done by Bertalanffy et al¹⁹ observed a significant ($p<0.01$) acute pain reduction during transport of patients treated by TENS. In other study done by Maayah²⁰ a significant ($p=0.01$) reduction of acute pain due to musculoskeletal disorders at the end of follow up assessment was observed. The results of the meta-analysis done by Milne et al presented no evidence to support the use of TENS in the treatment of chronic low back pain²¹. Two small studies produced inconclusive results, with a trend toward improvement with TENS and in chronic back pain, there is conflicting evidence regarding its ability to help relieve pain²².

The patient improvement and compliance was more in group A treated with TENS. In this group out of 30 patients 24 patients (80%) got improved. In group B out of 28 patients 18 patients (64.28%) were improved. According to Johnson, the time from the start of stimulation to the onset of analgesia varies from almost immediate to hours (on average, 20-30 minutes in over 75% of patients and 1 hour in 95% of patients)²³. In the present series, 80% of patient had analgesia within 30 minutes. This result correlates with study of Ordog, who proved that TENS was effective as a combination of acetaminophen and codeine in the treatment of acute pain²⁴.

Conclusion

TENS is the appropriate treatment for acute LBP which cannot be treated less expensively, more safely or more effectively by other means. From this present study it may be concluded that effect of TENS on patients with acute LBP is beneficial. Special attention should be given to the risks and benefits of long-term use, which more appropriately addresses the realities of managing acute LBP.

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