

EFFECT OF THERAPEUTIC LASER IN THE MANAGEMENT OF DIABETIC NEUROPATHY PAIN

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ABSTRACT

Background: Diabetes mellitus is characterized by absolute or relative insulin deficiency, hyperglycemia and development of diabetic specific micro vascular complications in retina, kidney and nerves. Micro vascular disease significantly contributes to increased morbidity and indirectly contributes to mortality through diabetic neuropathy. Pain may occur with either acute or chronic neuropathy. It results from small fibre damage. Lancinating, neuralgia - type will follow ectopic generation of nerve impulses, whereas chronic, burning pain is due to nerve ischaemia. Therapeutic laser (TL) is gaining much importance in reducing neuropathic pain

Objective: To find out the effect of therapeutic laser in the management of diabetic neuropathy pain by comparing with regular medication.

Methods: 50 patients were selected by using lottery method of simple random sampling procedure into two groups (Group A 25 and Group B 25) equally. Group A was treated with medications (oral hypoglycemic, analgesics and anti - depressant drugs) for four weeks. Group B was treated with TL for 10mins for 4 times a week for 4 weeks with a dosage of 4J/cm². Their pre & post treatment values were extracted basing on modified Toronto clinical neuropathy score (mTCNS).

Results: Both groups pre and post test values were extracted for four weeks and analyzed individually by using Wilcoxon signed rank test. Both groups showed variation in their scores individually. When compared between the groups by using Mann Whitney U - test, group B showed remarkable variation when compared with group A.

Conclusion: TL has shown remarkable reduction in pain score of group B when compared with group A. TL is one of the best treatment modality in reducing neuropathic pain. Physiotherapists can gain access with this treatment to proliferate their practice in treating diabetic neuropathic pain. . [*Ethiop.J. Health Dev.* 2019; 33(2):142-144]

Key words: Diabetes mellitus (DM), diabetic neuropathy (DN), low level laser irradiation (LLL), Mc Gill Pain Questionnaire (MPQ), modified toronto clinical neuropathy score (mTCNS).

Introduction

Diabetes mellitus (DM) is characterized by absolute or relative insulin deficiency, hyperglycemia and development of diabetic specific micro vascular complications in retina, kidney and nerves (1). Micro vascular disease significantly contributes to increased morbidity and indirectly contributes to mortality through diabetic neuropathy (DN) (2). In an epidemiological study on neuropathy, Pirart et al., showed prevalence at diagnosis is of 8%, rising to 50% at 25 years duration of diabetes.

The diabetic neuropathies are various disorders of nerve function associated with diabetes. On the basis of electrophysiological abnormalities, over 50% of patients will develop nerve dysfunction (numbness, tingling and pain). Pain occurs due to metabolic insult to the nerves which causes neurovascular insufficiency (3), impairment of neuronal blood supply and accumulation of toxic substances which promotes neurotoxicity and causes direct neuronal damage or decrease nerve blood supply (4) and activation of protein kinase C (5) which induces vasoconstriction and finally causes nerve hypoxia.

Pain may occur with either acute or chronic neuropathy, results from small fibre damage. Lancinating, neuralgia - type will follow ectopic generation of nerve impulses, whereas chronic, burning

pain is due to nerve ischaemia. Painful neuropathy is often associated with insomnia, depression, may rarely be associated with marked wasting, weakness and loss of up to 60% of body weight which is termed as neuropathic cachexia(6).

Medications such as analgesics are used to reduce the pain. Apart from these, tricyclic antidepressants and anticonvulsives are used, but each of these has their own side effects. Various physiotherapy therapy modalities were used to treat neuropathic pain, but among them therapeutic laser (TL) Galium Arsenide (Ga - As) is gaining much importance now a days in reducing neuropathic pain because of its more wavelength and depth of penetration when compared with other types of lasers. It can be administered safely to reduce pain symptoms as there are no side effects with laser therapy. Laser is broadly used as an analgesic, anti inflammatory and for tissue healing (7).

Pain caused due to diabetic neuropathy is measured using modified Toronto Clinical Neuropathy Score (mTCNS) (8). It is broadly used in the evaluation of diabetic neuropathy pain in clinical trials.

Objective: The objective of the study is to find out the effect of TL in the management of diabetic neuropathy pain by comparing with regular medication.

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Methods

This study was conducted in Vaagdevi physiotherapy and pediatric rehabilitation centre, Warangal, Telangana, India. The patients who were diagnosed with DN pain between age of 45 – 60 years were included into the study basing on mTCNS, who had type 2 diabetes mellitus for more than 10 years and complaint of foot pain. Patients suffering with other neurological, orthopedic and cardiac problems were excluded from the study. The study protocol was explained clearly to the patients and written consent was obtained before the study. Their medical history, demographics, physical and neurologic examination was performed initially for all patients. Later the patients were randomly separated into two groups basing on simple random sampling, hat technique. Total 50 (male and female) patients suffering with diabetic neuropathy pain were selected for the study and divided into two groups.

Outcome measures: The intensity of pain pre and post treatment was measured by using mTCNS(8). The mTCNS is a brief semi-structured, clinical interview and examination during which the trained raters systematically administered the 11 items which assess symptom scores and sign scores of DN. Each symptom and sign of DN has a maximum score of 3. Off these pain is one of them.

Methodology

The total numbers of 50 patients are divided into two groups by using simple random sampling, hat method. By using this method the number of 50 patients were divided into two groups i.e., group A and group B. Group A (n_1) had 25 patients. They received regular medication for diabetes and DN (oral hypoglycemic, methycobalamine, analgesics and anti - depressant drugs like amitriptyline desipramine and nortriptyline). Their pre values were recorded and the patients were asked to come weekly once for evaluation for four weeks. Follow up was made regularly through phone. Group B (n_2) had 25 patients. They received TL (Gallium arsenide (Ga -As) of 904 nm) for 4sessions per week for four weeks. As the pre-stored program, the equipment delivered the dosage of 4j/cm²for 10 mins. All the patients were made to lie comfortable; the treatment area was exposed and cleaned with alcohol to avoid reflection of the rays. The area of exposure was lumbo-sacral area, posterior aspect of legs and soles. As a safety measure goggles are used for both patient and therapist. Both the groups pre and post treatment values were recorded and statistically analyzed (9).

Data analysis

This study was concerned with comparison between the effects of drug treatment versus TL on pain intensity in patients with diabetic neuropathy. After four weeks of treatment both group scores were analyzed. The mean and standard deviation value of both groups is represented in Table no 1. The pre and post treatment scores within the groups is calculated by using wilcoxon signed rank test (paired sample). Later on both the groups were compared by using Mann Whitney U test.

Results

In group A ($n_1 = 25$), the signed rank test value of W is 0 (The table value at 5% Level of significance (LOS) is 15), there is a significant variation within the group scores. Off these only 14 samples has revealed variation in their pain scores. 11 samples did not show any effectiveness in their pain scores by regular medication. In group B ($n_2 = 25$) the W value is 0 (The table value at 5% LOS is 76), there is a significant variation within the group scores. Off these total 15 samples has shown variation in their pain scores due to application of TL. When compared between the two groups by using Mann Whitney U test, the calculated U value is 66. (The table value at 5% LOS is 211). There is a significant difference between group A and group B.

Comparatively group B pain scores (0.96) were low and considering all the sample values in group B. There is a marked variation comparing to group A (2.12).

Table 1: Mean and standard deviation of mTCNS for Group A and B

	Group - A		Group - B	
	Pre	Post	Pre	Post
Mean	2.8	2.12	2.56	0.96
Standard deviation	0.41	0.73	0.51	0.35

Discussion

DN is one of the most common complications of DM. In neuropathy, nerve hypoxia results due to decreased micro circulation to the peripheral parts (10-11). So the treatment is targeted to improve the micro circulation in the peripheral parts of the body. When compared within the groups by using Wilcoxon signed rank test. The results showed significant reduction of pain. The comparison between the groups was done by using Mann Whiney U - test, which showed remarkable reduction in pain scores in group B.

Ga - As laser has a comparatively long wavelength and is directly absorbed in the tissues at a depth of 1-2 cm and has indirect effect up to 5 cm. The possible reason for the reduction of pain could be due to increased micro circulation, increase ATP production, acts as analgesic and anti-inflammatory(12). The other possible explanatory factor could be due to increased circulation there causes increased release of cytokines and growth factors which caused vasodilatation and leads to formation of new capillaries (13).

Pain associated with laser – mediated treatment effects has documented in various studies. A number of groups has reported that analgesic effects of laser irradiation in various types of chronic pain as well as in neuropathic and neurogenic pain syndromes (14-16) showed positive effects. Consequently a report on the management of low back pain showed marked decrease in its intensity with application of laser (17).

Conclusion

Our results conclude that TL (Ga – As) is one of the best treatment modality in reducing neuropathic pain. Physiotherapists can gain access with this treatment to proliferate their practice in treating diabetic neuropathic pain. As neuropathic pain is one of the burning complications of DN, it has to be addressed at the earliest. As the individual suffers with pain, their level of concentration will be altered. Sherrington et al. stated that pain is a sensation which draws the attention of an individual as a whole. The same way, even the patient suffering with neuropathic pain complication his level of concentration on his works will be changed. So by using TL the pain of an individual will be reduced and thereby the patient will have a healthy life and proper concentration on his works and finally he or she can lead a healthy life.

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