EFFECTIVENESS OF HELIUM-NEON AND GALLIUM-ARSENIC LASER THERAPY IN PATIENTS WITH DIABETIC NEUROPATHY - A COMPARITIVE STUDY

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Abstract-
BACKGROUND: Diabetes is a complex condition that is associated with many complications out of which diabetic neuropathy is most common. There are so many forms of medications available for treating diabetic neuropathy of foot. The advancements in physiotherapy placed LASER at a point where it can be used to treat most of the complications of diabetic neuropathy among that in order to treat pain, low level laser is frequently employed. The purpose of this study is to focus on the Effects of He-ne and Ga-as laser in diabetic neuropathy patients.
MATERIALS AND METHODS: An experimental study was done in Saveetha physiotherapy OPD, Saveetha Medical College and Hospital Thandalam, Chennai. All the 30 patients were assessed with Michigan Neuropathy Screening Instrument (MNSI), NPRS before the initiation of treatment and for 4 weeks the patients were treated with, He-ne, Ga-as laser. After 4 weeks they are assessed again and post values are being noted and analyzed.
RESULT: The post-test mean value of the Michigan neuropathy in the group Ga-as was 4.40 and the group He-ne was 4.00. This shows that the result value for pain in the group He-ne is comparatively lesser than the group Ga-as.
CONCLUSION: This study shows that there was an improvement in both groups with He-ne and Ga-as laser therapy. However, Ga-as laser show extremely significant improvement than He-ne laser.

INTRODUCTION

Globally, type 2 diabetes mellitus (T2DM) is growing more prevalent. It has been linked to a number of microvascular and macrovascular problems. The most frequent of all the effects is reportedly peripheral neuropathy [1]. Peripheral neuropathy is common in T2DM patients in impoverished countries, with prevalence estimates ranging from 25 to 50%. More hospital stays result from diabetic peripheral neuropathy (DPN) than from any other T2DM side effect [2]. Poor quality of life and functional disability are linked to painful DPN. Painful DPN is brought on by tissue damage, the Vasa nervorum, and axons. Despite the fact that all nerve fibres are susceptible to injury, small myelinated and unmyelinated fibres that carry pain and temperature are particularly sensitive [3]. Decreased microcirculation is associated with protective feeling loss and intrinsic foot muscle atrophy in T2DM individuals with a history of diabetes, which can result in calluses, ulcers, and skin and bone infections [4].

Diabetic neuropathy frequently manifests as pain in the lower limbs, especially in the soles and toes. Currently, a number of drug therapies aiming at symptomatic alleviation are used to treat painful DPN [5]. These medications are effective, despite the fact that they frequently cause systemic adverse effects and do not stop the development of the underlying neuropathy. In addition to drug therapy, acupuncture, infrared therapy, and various electrotherapies like transcutaneous electrical nerve stimulation (TENS) and spinal cord electro stimulation have all been used [6]. The majority of conservative therapeutic options for unpleasant DPN are currently being studied for their efficacy. Due to its ability to have a biostimulational effect on the nervous system, one electrotherapy method that has been utilised to treat nerve disorders and injuries is low-level laser therapy [7].

Low-level laser therapy has also been applied to the treatment of diabetes-related conditions such foot ulcers. There is a lack of information addressing how low-level laser therapy affects painful DPN in T2DM patients, despite the fact that it has been demonstrated to be particularly helpful in encouraging nerve regeneration [8]. This study's objective is to assess the effects of low-level laser therapy on Type 2 DM patients who have uncomfortable DPN. Low Laser Therapy (LLLT) is given for diabetic neuropathy .

Although high blood sugar (glucose) can harm nerve cells all over the body, diabetic neuropathy most frequently results in nerve damage to the legs and feet. Damage to blood vessels and nerves, as well as high blood sugar, are causes. Other factors: Nerve inflammation brought on by an autoimmune reaction. A specialized kind of electrical signals intended to target and stimulate the nerve cell fibres is used as the first step in laser therapy. These nerves are revived and reactivated during a course of treatment [9].

Time, intensity, and frequency of treatment are all components of the distinctive protocols we have created, which assist in partially undoing the harm caused by diabetic neuropathy. The recovery will occur more quickly and effectively the earlier care is provided. The employment of particular light wavelengths in laser therapy is used to cure painful and crippling illnesses [10]. Damaged cells are exposed to light energy, which in turn drives intercellular activity. This lessens localised discomfort and hastens the healing of the injured cells. The healing process is finished once the cells have recovered. rapid pain relief without the need for habit-forming prescription painkillers. Low level lasers are said to reduce pain or stimulate and promote cell function, but high-power lasers are employed in laser medicine to cut or destroy tissue. Giving LLLT below the dose range does not seem to have any impact, and the effects of LLLT seem to be restricted to a specific range of laser wavelengths.

AIM:
The aim of the study is to know the effectiveness of He-Ne and GA-As laser therapy in diabetic neuropathy patients.

OBJECTIVE:
Objective 1: To determine the effect of He-ne laser therapy on diabetic neuropathy using MNSI and NPRS.
Objective 2: To determine the effect of Ga-as laser therapy on diabetic neuropathy using MNSI and NPRS.
Objective 3: To compare the effect of He-ne and Ga-as laser therapy on diabetic neuropathy using MNSI and NPRS.

METHODS:
Study Type: Experimental study.
Study Setting:
Samples have been selected from Saveetha Medical College Hospital, Thandalam, Chennai-602105 according to the inclusion and exclusion criteria.
Sampling technique: Convenient sampling technique.
Sample size: 30
Inclusion criteria:
- age group 55-75 years
- history of diabetes
- both genders
- patient diagnosed with neuropathy of common peroneal nerve

Exclusion criteria:
- Subjects who are non-cooperative
- Subjects with unstable vitals
- Subjects with other neurological, orthopedic and cardiac problems are excluded from the study

Data collection and Analysis:
A Ga-as laser group and a He-ne laser group are used in this experimental work. The inclusion and exclusion criteria were used to choose the subjects, and each subject signed an informed consent form. By using even and odd procedures, the subjects were divided into two groups. The 15 participants in the He-ne group received He-ne laser treatment, and the 15 individuals in the Ga-as group received Ga-as laser treatment. Using the paired 't-test and the unpaired 't-test, the values were statistically evaluated.

RESULTS:
Quantitative data from the Michigan Neuropathy Screening Instrument was statistically analyzed, and the results showed statistically significant differences between groups He-ne and Ga-as as well as within each group. The Michigan Neuropathy Screening Instrument's post-test mean value for group He-ne was 4.40 and for group Ga-as was 4.00.

Quantitative data from the NPRS were statistically analyzed, and the results showed statistically significant differences between groups He-ne and Ga-as as well as within each group. In group He-ne, the post-test mean NPRS score was 2.13, while in group Ga-as, it was 1.53.

TABLE 1: Pre-test and Post-test mean values of Group Ga-as and Group He-ne using Michigan neuropathy screening instrument.

		MEAN	SD	SEM	P
GROUP Ga-as	PRE-TEST	9.60	2.75	0.71	<0.0001
	POST-TEST	4.00	1.93	0.50	
GROUP He-ne	PRE-TEST	9.80	2.57	0.66	<0.0001
	POST-TEST	4.40	1.99	0.51	

TABLE 2: Comparison between the post-test values of Group Ga-as and Group He-ne using Michigan neuropathy screening instrument

TEST(post-test)	MEAN	SD	SEM	P-value
Group He-ne	4.40	1.99	0.51	<0.0001
Group Ga-as	4.00	1.93	0.50	<0.0001

GRAPH 1: Comparison between the post-test values of Group He-ne and Group Ga-as using Michigan neuropathy screening instrument

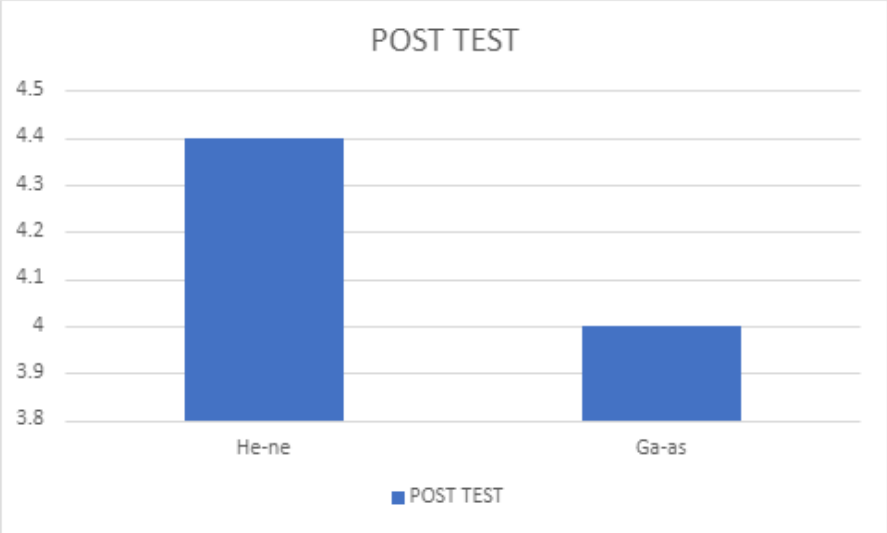


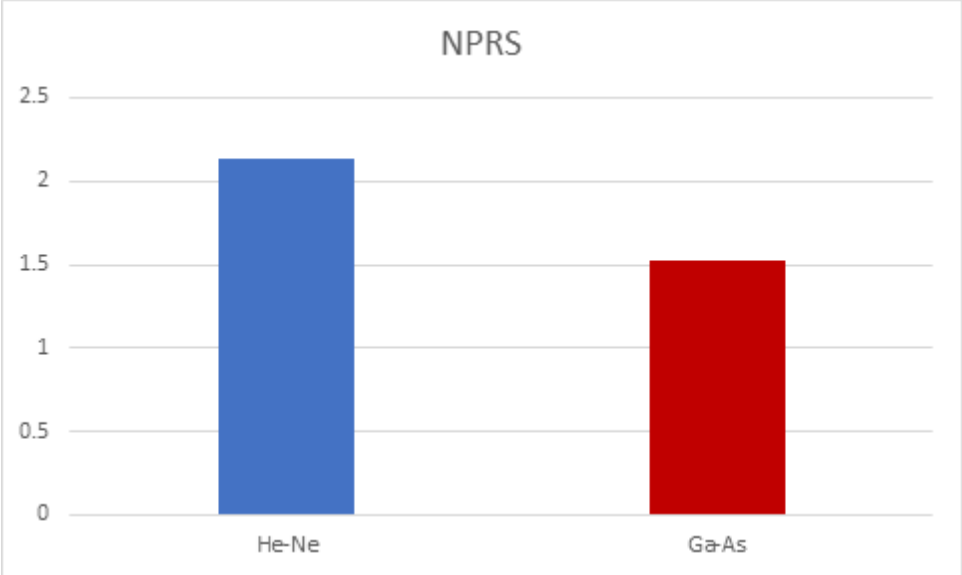
TABLE 3: Pre-test and Post-test mean values of Group Ga-as and Group He-ne using NPRS

		MEAN	SD	SEM	P
GROUP Ga-as	PRE-TEST	6.73	2.73	0.40	<0.0001
	POST-TEST	1.53	1.58	0.41	
GROUP He-ne	PRE-TEST	6.87	1.51	0.39	<0.0001
	POST-TEST	2.13	1.25	0.32	

TABLE 4: Comparison between the post-test values of Group He-ne and Group Ga-as using NPRS

TEST(POST TEST)	MEAN	STANDARD DEVIATION	SEM	P- value
Group Ga-as	1.53	1.58	0.41	<0.001
Group He-ne	2.13	1.25	0.32	

GRAPH 2: Comparison between the post-test values of Group He-ne and Group Ga-as using NPRS



DISCUSSION:

This study was aimed at proving the effectiveness of He-ne and Ga-as laser fpr patients with diabetic neuropathy.In this study, 15 participants received He-ne laser and other 15 received Ga-as laser twice a week for 4 weeks. A statistically significant difference was found between Group Ga-as and Group He-ne as well as within the group as a result of the statistical analysis performed on the quantitative data. The post-test mean value of the Michigan neuropathy in the group He-ne was 4.40 and the group Ga-as was 4.00. This shows that the result value for pain in the group Ga-as is comparatively lesser than the group He-ne **.**

A similar study done in the year 2019 by Chiranjeevi Jannu, Vahini devi, Prathap. Suganthirababu, Goverdhan Puchchakayala where 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/cm 2. Therapeutic laser has shown remarkable reduction in pain score of group B when compared with group A. Therapeutic laser is one of the best treatment modalities in reducing neuropathic pain. Their pre & post treatment values were extracted basing on modified Toronto clinical neuropathy score (mTCNS).

High intensity laser therapy has been studied as a potential long-term treatment for diabetic neuropathy by Joseph Costello Jar [11]. There is to demonstrate the efficiency of HPLT as a treatment solution for patient with Diabetic neuropathy. They start the treatment on patients for 30 min with different wattage and dosage depends on symptoms. They conclude that HPLL very effective to accelerate new regeneration as well as vasodilatation of blood vessels than LLLT. Homeroom basher researched the effectiveness of LLLT in treating pain and sensor motor abnormalities caused by diabetic polyneuropathy [12]. This study looked into how well low-level laser therapy (LLLT) treated patients with diabetic neuropathy for their pain problems. In this trial, 60 patients with diabetic neuropathy who were matched for gender, age, BMI, VATS, and TCSS had laser therapy twice a week for five minutes each for a month. According to this , there was no statistically significant difference in terms of gender, age, duration, heights, weights, VAS, or TCSS between the case group (laser therapy) and the control group (sham laser).

According to Jhan Maltin Md and Elizabeth Marriott, a combination of local anesthetic and electric current effectively manages diabetic neuropathy pain [13]. This article reports a development in electromagnetic therapy involving the use of a local anesthetic and an electric current at the same time. Treatment plan -patient received a total of 12 electro analgesics treatment for 3 or 4 weeks given 3 times in a week. Treatment duration 25 min. During the first and third treatment of each week injection of 0.25% bupivacaine were performed at the end of study they concluded that out of 100 the 87% pts get relief from pain and remaining patients will also improve quality of life. Gerlof D. Valk, Avnocid C Kappelle.et.al has done **t**reatment of diabetic poly neuropathy with the neurotrophic peptideORG2766[14]. The efficacy of the neurotrophic peptide ORG2766 in diabetic patients with polyneuropathy has been studied.124 patients were randomized in five groups to receive 0.1,0.4,215 mg ORG2766 once daily administered subcutaneously 52 weeks. In this experiment concluded that ORG2766 in contrast to earlier reports is not effective in treating diabetic neuropathy [15].

Triantafillou Diangelo's.et al studied about efficiency of administration of ACE inhibitor for 2years on automotive and peripheral neuropathy in patients with DM [16]. Aim to evaluate the efficiency of quinapril on diabetic cardiovascular autonomic neuropathy and peripheral neuropathy. Treatment method 63 patients using quinapril 200g per day or placebo for 2years. It has been concluded that treatment with quinapril improves DCAN [17].

LIMITATIONS OF THE STUDY :

1. The study was done in a short time with a limited number of subjects.
2. No proper follow-up data was collected.

RECOMMENDATIONS:

1. To make the study more valid, a long-term study with a large sample size is recommended.

2. Further studies are recommended to analyze the effect of other modified exercise regimens.
3. Regular follow–up should be done.

CONCLUSION:

According to this finding, group Ga-as laser was found to be more effective than He-ne laser group at reducing pain and intensifying recovery in diabetic neuropathy patients.

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