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MANAGEMENT OF DIABETIC PERIPHERAL NEUROPATHY WITH LOW-LEVEL LASER THERAPY IN AN 81-YEAR-OLD MALE: A CASE REPORT

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ABSTRACT

Objective: To describe the management of diabetic peripheral neuropathy (DPN) in an 81-year-old male using low-level laser therapy (LLLT).

Clinical Features: An 81-year-old male with long-standing type 2 diabetes mellitus had bilateral diabetic peripheral neuropathy (DPN) of the hands and feet along with an ulcer on his right foot. He had been prescribed several medications by his primary care physician, with little relief. He expressed interest in pursuing a non-pharmaceutical approach and asked if low-level laser therapy could be a possible intervention.

Interventions and Outcome: He received 11 treatments with LLLT over a 6-week period. The protocol used for the LLLT was 3000 Hz for 5 minutes on both hands and feet for 20 minutes total. The post-therapy re-evaluation revealed improvement in the patient's symptomatology bilaterally.

Conclusion: The case suggests that LLLT may have positively affected this patient's diabetic neuropathy symptoms. While other treatment options are offered to patients, LLLT should be considered a possible low-risk intervention. LLLT is showing promise as a possible treatment for diabetic neuropathy and warrants further study. *(J Contemporary Chiropr 2025;8:88-91)*

Key Indexing Terms: Diabetic Peripheral Neuropathy; Type 2 Diabetes; Low-Level Laser Therapy

INTRODUCTION

Diabetic peripheral neuropathy (DPN), a prevalent and debilitating complication of type 2 diabetes mellitus, poses a substantial challenge to healthcare providers worldwide. (1) Not only is DPN the most common complications of diabetes, but it can also significantly influence the patient's quality of life and activities of daily living. (2) Characterized by damage to small blood vessels that supply the nerve, DPN manifests symptoms ranging from mild discomfort to severe pain and functional impairment. (3) DPN involves changes in the sensory, motor, and autonomic nerves and can lead to muscle weakness, cramps, spasms, and loss of balance. (4) In addition, foot ulcers are one of the most aggressive and expensive complications of diabetes. (5) These symptoms can lead to falls with the possibility of more significant injuries requiring medical intervention. Diabetic neuropathy is the 3rd most common neurological disorder, and it is currently estimated that it affects approximately 50% of people with diabetes mellitus. (1,3)

Traditional therapeutic approaches, including glycemic control diets, exercise regimens, and pharmaceuticals (e.g., duloxetine, gabapentin, tramadol) often fall short of providing effective relief. (6) In addition, pharmaceuticals can also have side effects such as drowsiness, lethargy, and unsteadinessm which can limit their use and necessitating the exploration of innovative and promising interventions. (7)

One such emerging modality is low-level laser therapy (LLLT). LLLT is a non-invasive and low-risk therapeutic technique that utilizes low-intensity light that may stimulate cellular function, accelerating the healing of

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injured nerve fibers. (3,8) Over the past 3 decades, LLLT has garnered attention for its potential in alleviating the symptoms associated with DPN. (7) LLLT's effectiveness depends on treatment parameters, including wavelength, power density, pulse repetition rate, and energy density. (9) This case report aims to contribute to the growing body of evidence by presenting a detailed account of the management of DPN using LLLT.

CASE REPORT

An 81-year-old male with a history of type 2 diabetes presented to the clinic with complaints of bilateral upper and lower extremity pain, numbness, and tingling, along with an ulcer on the patient's right foot. He expressed difficulty walking, playing the guitar, and performing activities of daily living due to neuropathic discomfort. The patient was prescribed and taking CoQ10, Losartan, Amour Thyroid, Glipizide, and metformin. The patient's mother and 2 sisters were all diagnosed with type 2 diabetes mellitus. Despite conventional diabetic management and lifestyle modifications (limited due to DPN), his symptoms persisted. He explained that medicinal treatments have failed to be effective for his neuropathy and expressed interest in LLLT. Written consent for publication was obtained.

Clinical Findings

At intake, the patient underwent a comprehensive physical and chiropractic examination. The patient's vitals were as follows: temperature 97.9, HR 70/min, BP 126/86 mmHg, RR 18/min, Ht 67 in, WT 184.2, BMI 28.85 index (overweight). He had decreased ranges of motion in the cervical, thoracic, and lumbar spine with no pain. Additionally, the C5 deep tendon reflex was graded +1 and muscle strength at C5 and T1 was graded 4/5, and L4 was graded 3/5. A sensory examination of the hands and feet revealed decreased light and deep sensation bilaterally. We also noted that the patient had a dime-sized ulcer on the medial side of his right foot. Plain film x-rays were taken of the patient's cervical, thoracic and lumbar spines. They revealed degenerative disc disease throughout the spine as well as mild osteoporosis. The Quadruple Visual Analogue Scale (QVAS) and Patient Health Questionnaire-9 (PHQ-9) depression severity screenings were used as the outcome assessment for this patient's symptomatology. The QVAS score was 43%, indicating low-intensity pain symptoms. The PHQ-9 score was 16, revealing moderately severe depression. The patient expressed that he felt his limitations with daily activities were due to neuropathy and contributed heavily to the PHQ-9 score.

Diagnosis and Management

The patient's prior diagnosis of diabetic peripheral neuropathy was confirmed during the examination, along with the diabetic ulcer on the right foot. This confirmation involved assessing clinical findings consistent with DPN, such as diminished sensation, muscle weakness, and impaired reflexes. Although the patient also had degenerative disc disease (DDD), confirmed by x ray, the symptoms were non-dermatomal and not consistent with DDD radiculopathy. Informed consent was obtained, including discussions of alternative pharmacological options and referral to a wound treatment center, but the patient opted for LLLT. Treatment was prescribed for 2 sessions per week for 6 weeks, with a re-evaluation scheduled at the end of the treatment period.

Therapeutic Intervention

LLLT was administered to both hands and feet as well as the right foot ulcer. Treatment was set at 3000 Hz. This frequency and timing were chosen using the treatment protocols listed in the protocol manual of the laser. Each appendage received 5 minutes of treatment, totaling 20 minutes per session. The laser was applied in a continuous wave with circular motion to ensure coverage and even distribution across the treated areas. A total of 11 sessions were completed over the 6-week period.

Follow-Up

At the re-evaluation, the sensory examination showed improved in sensation bilaterally, and the ulcer on the right foot had reduced by 50% in size. The QVAS and PHQ-9 scores were reassessed, showing a reduction to 13.3% and 2, respectively. The patient reported improved ambulation, reduced pain, and had resumed playing the guitar. He also noted that his depressive symptoms had significantly lessened, which he attributed to greater mobility and independence. No adverse effects related to LLLT were reported. Follow-up assessments over the subsequent month indicated that improvements in neuropathic symptoms were maintained. The patient was offered continued care at a frequency of 1 time per week but decided to receive care on an as needed basis.

DISCUSSION

Diabetes prevalence, deaths, and disabilities attributed to type 2 diabetes and associated costs present a large burden to the healthcare system. (5) New conservative and low-cost therapeutic modalities like

LLLT offer promising options. (1) LLLT's therapeutic mechanism is thought to involve photochemical effects, enhancing cellular processes at the mitochondrial level. Specifically, low-intensity light can stimulate adenosine triphosphate (ATP) production, reduce oxidative stress, and promote cellular proliferation—key factors in nerve repair and regeneration, which may slow DPN progression. (4) Additionally, studies have noted that LLLT can stimulate macrophages, facilitating wound healing in diabetic ulcers. (2,10) The observed improvement in pain, sensation, and ulcer size in this patient aligns with these theoretical frameworks.

To further explore the efficacy of low-level laser therapy (LLLT) for diabetic peripheral neuropathy (DPN), a review of recent studies highlights both encouraging outcomes and ongoing challenges due to methodological inconsistencies.

Several studies have reported favorable effects of LLLT on pain relief and nerve function improvement in DPN. A 2016 study demonstrated that LLLT significantly reduced pain and improved sensation in DPN patients compared to a placebo group, attributing these outcomes to enhanced microcirculation and nerve regeneration due to mitochondrial activation and ATP production stimulated by LLLT. (7) Similarly, a randomized controlled trial (RCT) observed substantial improvements in pain scores and sensory nerve function in patients who received LLLT, concluding that the treatment may offer a viable non-invasive option for DPN management. (6)

Despite promising results, however, systematic reviews and meta-analyses reveal considerable variability in LLLT's effectiveness due to inconsistencies in treatment parameters such as wavelength, dose, and treatment duration. A 2020 systematic review found that while several studies reported symptomatic relief and improved nerve function, the heterogeneity in study designs and treatment protocols made it difficult to draw definitive conclusions. (1)

It's important to consider other potential factors, such as placebo effects or natural symptom progression, as contributors to the observed changes. Some studies have suggested that the analgesic benefits observed with LLLT could be partially attributed to placebo effects. For instance, a 2017 review indicated that the improvements in some patients might be related to psychological responses rather than the photobiomodulation effects of LLLT. (5) This reinforces the need for robust, well-designed RCTs with larger sample sizes and standardized protocols to isolate the specific effects of LLLT.

It is also important to recognize the limitations of this case report. A major limitation is the absence of a long-term follow-up, which precludes assessing the sustainability of LLLT's effects on neuropathic symptoms. Additionally, while PHQ-9 and QVAS scores provide insight into symptom severity, these measures may not optimally reflect DPN progression. Importantly, further investigations should examine LLLT in the context of standardized protocols and diverse populations to better define its therapeutic scope in DPN.

While initial findings suggest that LLLT may positively impact pain, nerve regeneration, and wound healing in DPN, the evidence is not yet conclusive. Further RCTs with larger cohorts, standardized parameters, and placebo-controlled designs are essential to establish the reliability and clinical applicability of LLLT for DPN management.

CONCLUSION

LLLT appears to be a safe and effective modality for managing DPN. The case report illustrates that LLLT can lead to a significant reduction in neuropathic pain and improvement in sensory function in an 81-year-old male with long-standing type 2 diabetes. However, several systematic studies and controlled trials concluded that there is not enough evidence thus far to recommend LLLT in treating DPN. (4,11) Given the positive results from this case and many other case reports, further research is warranted to explore the long-term benefits and optimal treatment protocols for LLLT in the elderly population with DPN.

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