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Review

Efficacy Of Low-Intensity Laser Therapy on Pain In Trigeminal Neuralgia – A Literature Review



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	Abstract
Published on: 21 Apr 2025	<p>Background: Trigeminal neuralgia (TN) causes severe facial pain, often triggered by touch or chewing, due to nerve compression. Traditional treatments, like anticonvulsants and surgery, may have side effects and limited effectiveness. Low-intensity laser therapy (LILT) is being explored as an alternative, showing promise in pain reduction and nerve healing. This review evaluates LILT's efficacy in managing TN.</p>
Published by: DrSriram Publications	<p>Methodology: A comprehensive literature study was done using the specified search criteria. To carry out a literature review, the search phrases "efficacy of low-intensity laser therapy in trigeminal neuralgia" were employed between the years 2014 and 2024. We have discovered 10 publications with complete text and methodologies for additional examination from diverse academic journals.</p>
2025 All rights reserved.  Creative Commons Attribution 4.0 International License.	<p>Results: We discovered 10 publications that included a low intensity laser therapy for all individuals. All articles designed for low intensity laser therapy patients showed benefits in all intervention groups.</p> <p>Conclusion: The review included 10 studies that utilized distinct low-intensity laser therapy protocols across various patient populations. All included articles reported positive outcomes, indicating the effectiveness of low-intensity laser therapy across different intervention groups</p>
	<p>Keywords: Trigeminal neuralgia (TN), facial pain, Low-intensity laser therapy (LILT).</p>

INTRODUCTION

Trigeminal Neuralgia (TN) is characterized by intense, paroxysmal facial pain that follows the distribution of the trigeminal nerve. This condition is known for causing one of the most excruciating types of pain a person can experience. The pain is often described as sharp, stabbing, or resembling an electric shock, and it is typically triggered by light touch, chewing, or speaking ¹.

TN primarily affects older individuals, with women being more frequently affected than men ². The pain is usually localized to one side of the face, involving the branches of the trigeminal nerve: the ophthalmic, maxillary, and mandibular divisions ¹. There are two recognized types of TN: primary (idiopathic) TN, which occurs without any underlying disease, and secondary TN, which arises due to conditions such as multiple sclerosis or other structural issues³.

In primary TN, vascular compression of the trigeminal nerve root is the most common cause. This compression, often caused by arteries or veins, leads to nerve demyelination, resulting in abnormal nerve firing and the onset of pain¹. In the case of secondary TN, demyelination or structural damage is caused by conditions such as multiple sclerosis (MS), where the myelin sheath of the nerve is disrupted, leading to improper nerve signal transmission⁴. Histopathological changes observed in TN include thinning or loss of the myelin sheath, which results in nerve hyperexcitability and spontaneous pain signals².

Managing TN can be challenging, with treatment options ranging from pharmacological therapies to invasive surgical procedures. The pathology of TN involves the compression or demyelination of the trigeminal nerve root, which is responsible for sensory innervation to the face. Pain occurs when the nerve is irritated or damaged. Histopathological changes observed in TN include thinning or loss of the myelin sheath, which results in nerve hyperexcitability and spontaneous pain signals².

Etiology of trigeminal neuralgia

Trigeminal neuralgia (TN) can be categorized into primary and secondary forms based on underlying causes. In primary TN, vascular compression of the trigeminal nerve root is often attributed to the etiology. This compression is typically caused by an artery or vein pressing against the nerve, which leads to demyelination and nerve irritation. It has been reported that the superior cerebellar artery is most commonly responsible for this compression⁴. In contrast, secondary TN occurs due to structural abnormalities or diseases affecting the trigeminal nerve. The most common cause of secondary TN is multiple sclerosis (MS), where demyelination of the trigeminal nerve fibers is experienced, often affecting both sides of the face⁵. Other causes include tumors or vascular malformations that can compress the nerve root, leading to pain³. Additionally, trauma to the face or head, as well as infections like herpes zoster, can lead to nerve damage and subsequent TN symptoms⁵.

Need for the study

This study is needed due to the limited effectiveness of current treatments for trigeminal neuralgia (TN). While anticonvulsants can provide temporary relief, they often have side effects and lose effectiveness over time. Surgical options, though effective for some, are invasive and carry risks such as complications and prolonged recovery. Therefore, safer, non-invasive treatments are essential. Low-Intensity Laser Therapy (LILT) offers a promising alternative, but more evidence is necessary to confirm its benefits and safety. This study will evaluate LILT's impact on pain intensity, attack frequency, and quality of life in TN patients.

Objective of the study

The primary objective of this study is to assess the efficacy of low-intensity laser therapy in reducing pain intensity, frequency of attacks, and improving the overall quality of life in patients diagnosed with trigeminal neuralgia. The secondary objectives include evaluating the safety and tolerability of LILT, identifying potential side effects, and exploring any long-term effects of the treatment.

MATERIALS AND METHODS

Study Design

The current study examines the efficacy of low-intensity laser therapy associated with pain in Trigeminal Neuralgia. This review of literature is based on the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) guidelines.

Inclusion Criteria

- Only articles published in the English language will be considered.
- The study will include full-text articles, rather than abstracts or summaries.
- Both sexes are encompassed
- The articles were published between 2000 and 2024.

Exclusion Criteria

- Articles published in languages other than the regional language were omitted.
- Articles published before 2000 were excluded.
- Studies that are not relevant to the specified keywords.

Methodology

The evidence was gathered from online web publications from different search engines, including Google Scholar, PubMed, and other obesity journals. A tailored search was conducted using a literature review on the efficacy of low-intensity laser therapy in trigeminal neuralgia. The period was designated as 2003 to 2024 to gather

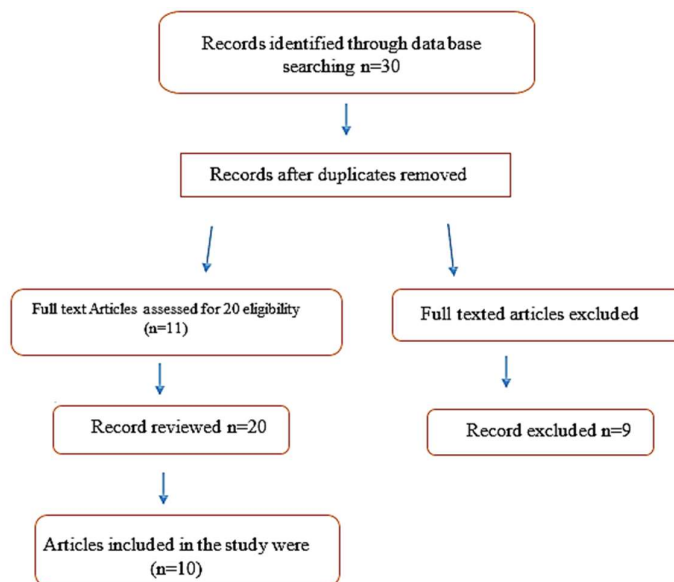
precise and current facts from throughout the globe over the past decade. We have identified a total of 10 articles that meet our specific criteria for inclusion and exclusion. All 10 publications were obtained in their entirety to be analyzed and continued with further analyzed. The results are derived using a systematic approach from all articles and displayed in a tabular format for enhanced comprehension. The selection techniques are detailed in the PRISMA

REVIEW OF LITERATURE

Sl no	Author	Title	Duration Of treatment	Outcome measures	Study design	Conclusion
1	İrem Karagözoğlu et al 2024 ⁶	Clinical Efficacy of Two Different Low-Level Laser Therapies for the Treatment of Trigeminal Neuralgia	3months	Brief Pain Inventory-Facial (BPI-facial) scale	A Randomized , Placebo-Controlled Trial	Both LLLTs can be considered alternative treatment modalities for TN, but the GRR laser treatment was more effective than the Nd:YAG laser treatment in reducing pain and improving the quality of life in patients with TN
2	Maryam Jali Sadrabad 2023 ⁷	Clinical efficacy of LLLT in treatment of trigeminal neuralgia – Case report	3weeks.	Visual analogue scale	A Randomized , Placebo-Controlled Trial	Increased blood pressure was noted. Diode laser therapy (940) was selected, leading to mild tingling after the first week and complete pain relief by the second week. No recurrence was observed after one month of follow-up.
3	Lais Tatiane Ferreira et al 2023 ⁸	Application of low-level laser therapy in trigeminal neuralgia	3weeks	Visual analogue scale	A clinical case	We hypothesize that the result is due to photobiomodulation providing neuroprotection through anti-inflammatory, analgesic, and antioxidant pathways, promoting the metabolic homeostasis needed for tissue function restoration.

4	Hans Jørgen Hansen ⁹	Low power laser bio-stimulation of chronic oro-facial pain. A double-blind placebo-controlled cross-over study in 40 patients		VAS-scales and global assessment of pain	A double-blind placebo-controlled trial	It is concluded that the possibility of a substantial placebo response should be taken into consideration using 904 nm (IR) lasers for pain treatment in patients with this type of chronic oro-facial pain.
5	Antonio L. B. Pinheiro, et al 2017 ¹⁰	The use of laser phototherapy in the management of trigeminal neuralgia pain: two decades of clinical experience	3months	Vas scale	Experimental study	The results were statistically analyzed and showed that, the use of lower Energy Density in smaller number of sessions in younger patients presents higher effectivity on treating the pain on TN patients.
6	Intsar S. Waked , et al (2015) ¹¹	Low Level Laser Therapy for the treatment of Trigeminal Neuralgia after Oral surgeries		Numerical rating scale	Experimental	LILT was more effective than placebo in trigeminal neuralgia and the trigger points application was superior to nerve path application

7	Vernon L, et al 2014 ¹²	Low-level Laser Therapy for Trigeminal Neuralgia	3months	Vas scale	Case reports	Both patients were treated once per day for five consecutive days, followed by a two-day interval. This regimen continued until the total number of applications reached 20.
8	Yasser Ibrahim Seada, et al 2013 ¹³	Comparison between Trans-Cranial Electromagnetic Stimulation and Low-Level Laser on Modulation of Trigeminal Neuralgia	4weeks	numerical rating scale, maximal oral mouth opening using a digital calibrated caliper	Experimenta l study	Repetitive transcranial electromagnetic stimulation at 10 Hz, 50 mA for 20 minutes is more effective than low-level laser therapy for reducing trigeminal pain and increasing oral mouth opening and muscle tension in multiple sclerosis patients.
9	Robert Antonić et al ¹⁴	The effects of low level laser therapy on the management of chronic idiopathic orofacial pain: trigeminal neuralgia, temporomandibular disorders and burning mouth syndrome	12months	Vas scale	Experimenta l study	LLLT has proven to be an effective intervention in reducing pain in TN, TMD and BMS patients. Better results can be achieved with higher wavelengths.
10	HK Kim, et al(2003) ¹⁵	The effect of lower-level laser therapy on trigeminal neuralgia	23weeks	Visual analogue scale	Experimental	These results suggest that lower level laser therapy has a desirable effect on trigeminal neuralgia.

FLOW CHART**DISCUSSION**

Trigeminal Neuralgia (TN) is a condition characterized by severe, episodic facial pain, which often results from either compression of the trigeminal nerve by blood vessels or its demyelination¹. Traditional treatments for TN include medications such as anticonvulsants and surgical options like microvascular decompression (MVD) or radiosurgery³. However, these treatments do not always provide sustained relief and may come with significant side effects. This has led to an increasing interest in alternative therapies, including Low-Intensity Laser Therapy (LILT).

Low-intensity laser Therapy, also referred to as low-level laser therapy (LLLT), is a non-invasive treatment that utilizes light in the red or near-infrared spectrum to stimulate biological tissues. It is believed to promote cellular healing, reduce inflammation, and modulate pain perception¹⁶. In the context of TN, LILT is thought to have analgesic effects by enhancing nerve regeneration, improving blood flow, and decreasing inflammation around the affected nerve¹⁷.

Several studies have examined the effectiveness of LILT in managing TN. A review by Sutherland et al.¹⁶ reported potential benefits of LILT in decreasing both the intensity and frequency of TN episodes. The proposed mechanism is that LILT stimulates mitochondrial activity, which increases ATP production, thereby facilitating tissue repair and alleviating pain¹⁸. Furthermore, LILT may help lower inflammation and oxidative stress, both of which can irritate the nerve in TN¹⁹.

Despite its promising potential, results regarding LILT for TN remain mixed. Some studies indicate that patients experience a significant reduction in Pain after LILT treatment, while others report only minimal improvement²⁰. Patients who underwent LILT reported decreased pain intensity and an enhanced quality of life. However, it is crucial to note that most studies have small sample sizes and lack long-term follow-up data, which restricts the ability to draw definitive conclusions about LILT's effectiveness in TN management.²¹

The success of LILT may depend on various factors, including the wavelength of the laser, treatment duration, and the frequency of sessions. In some instances, LILT may be most effective when used alongside traditional treatments like anticonvulsants or surgery¹⁶. Additionally, patients often prefer LILT due to its non-invasive nature and minimal side effects compared to pharmacological and surgical interventions.

While the exact role of LILT in managing TN is still not fully understood, current evidence suggests that it could serve as a valuable adjunctive therapy, particularly for patients who are not candidates for traditional treatments, surgery or those who experience inadequate pain relief from conventional treatments.

CONCLUSION

Low-Intensity Laser Therapy (LILT) shows promise as a non-invasive treatment for Trigeminal Neuralgia (TN), effectively reducing pain and improving quality of life with minimal side effects. However,

variability in treatment protocols and a lack of standardized guidelines highlight the need for more research. Future studies should focus on optimal parameters like wavelength, intensity, and duration, as well as long-term safety and efficacy. Until then, LILT may be considered in a multimodal treatment approach, especially for patients who don't respond well to conventional therapies or prefer non-invasive options.

Limitations and recommendations

Current research on Low-intensity Laser therapy for Trigeminal Neuralgia (TN) is limited by small sample sizes lack of rigorous randomised controlled trials, and inconsistent laser parameters, making it difficult to standardized treatment protocols. Most studies focus on short term pain relief with limited data on long term efficacy and rely heavily on subjective outcome measures. To strengthen the evidence based, future studies should involve high quality RCTs with larger samples, standardized laser settings, and long-term follow-up. Incorporating objective assessment tools and conducting comparative studies with conventional treatments will further clarify the clinical value and practical application of LILT in Trigeminal Neuralgia management.

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