

Effect of Low- Level Laser Therapy in the management of Carpal Tunnel Syndrome - A Systematic Review

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ABSTRACT

Carpal tunnel syndrome is by far most noticeable kind of peripheral compression neuropathy (CTS). The great majority of cases are idiopathic, with median nerve compression caused by nonspecific tenosynovitis. The goal of this research is to test the efficacy of low-level laser therapy (LLLT) in the intervention of CTS. The study intended to undertake a thorough review. Studies were gathered using databases including PubMed Central, Google Scholar, Rehab Data, Research Gate, and SAGE Journals. Reviews and case study were not included, but clinical research and randomized controlled trials were. Using keywords, 134 manuscripts were screened, 118 were discarded, 16 were included, and three were eventually retrieved for analysis. The study looked at the feasibility of LLLT in treating CT syndrome. Pain incidence alleviation and increased functional performance in persons with the syndrome of carpal tunnel was investigated in this study.

Keywords: Low-level laser therapy, Carpal tunnel syndrome, Physiotherapy

INTRODUCTION:

Carpal tunnel syndrome is a leading cause of peripheral compression neuropathy (CTS). The great majority of cases are idiopathic, caused by nonspecific tenosynovitis that pressures the median nerve. Patients complain endlessly of nocturnal Paresthesia or searing pain. Thenar muscle weakness and atrophy are linked to motor symptoms.¹ Tests include Tinel's and Phalen's signals in bedside diagnosis, as well as applying pressure on median nerve by using a sphygmomanometer on the wrist. Tinel's sign is production of paresthesia while trying to tap on the median nerve over the wrist. In Phalen's sign, maximum wrist flexion for 60 degrees mimic's symptoms. Women in their forties and fifties are generally stereotyped as patients. CTS are treatable surgically or non surgically. Surgical techniques are routinely performed on

those patients with chronic CTS symptoms, substantial sensory disturbance, or thenar muscle atrophy. Nonsurgical therapy is available for individuals with intermittent mild to moderate CTS symptoms and do not wish to undergo surgery.^{2,3} Therapeutic use of near-infrared light along with red light to biological tissues, typically in the wavelength 600 nm to 1000 nm range. It generates no heat, sound, or vibration². Women in their mid-fifties are typically regarded as patients. CTS can be treated either surgically or non surgically. Surgical techniques are regularly used on persons with chronic CTS symptoms, significant sensory disruption, or thenar muscle atrophy. Nonsurgical intervention is offered for those who have periodic mild to moderate CTS symptoms but do not want to undergo surgery. Laser is the therapeutic use of near-infrared light and also red light to biological tissues, often in the wavelength of 600 nm to 1000 nm. It continues to produce no heat or sound or vibration.

MATERIALS AND METHODS:

Study design: Qualitative study design. The PRISMA criteria were used to accomplish this systematic review.

Eligibility Criteria:

Selection of studies: PubMed Central, Rehab data, Google Scholar, and SCOPUS Journals are the databases used for searching articles. Results yielded from PubMed Central were 113, (Table 1), Rehab Data 4, Google Scholar 8, and SCOPUS 9. 134 articles, ended up with searching the keywords - Low-level laser therapy, Carpal tunnel syndrome, Physiotherapy. All articles are scrolled between the years 2000 to 2021.

Inclusion and Exclusion criteria:

While clinical trials and randomized clinical trials had been included, reviews and case reports were still not. Only research papers with patients diagnosed with CTS were included. All LLLT therapies (various forms, application techniques, wavelength, intensity, and duration) were evaluated to placebo or nonsurgical treatments. All nonsurgical treatments, with the exception of pharmacological therapy, were acceptable. Studies excluded are which investigated the effects of LLLT with another intervention and effects on some other intervention or the adding on an intervention without placebo LLLT.

STATISTICAL METHOD:

Evaluation of study features and bias risk: The articles' methodological extensively assessed. The tool Cochrane Risk of Bias was incorporated to analyze bias. It evaluated bias from seven sources as low, high, or uncertain, adding randomization, allocation concealment, participants were blinded and workers, outcome assessment blinding, outcome completion data , result disclosing and additional major bias.

Data extraction: The author gone through each included articles full text independently and drawn out all relevant papers for every study, including design and blinding, sample size, interventions for the laser, sessions, period and treatment, properties of the laser technically, outcome, assessment time, and final results. The information was gathered based on the characteristics and visible effects. Using descriptive analysis, the following research parameters were compared: study design, demographic data, number of participants, and kind of intervention, time, frequency, outcome measures, and study outcome.

RESULT:

Study flow: Three of the 134 research papers were chosen and linked dependability based on abstract and title. We observed a significant reduction because there was lack of information on technique or data to include in our review. Elimination yield final research. Studies value and bias risk, all three studies revealed a bias which is low, unclear bias and measure of outcome

data. The paper delves on feasibility LLLT in the management of CTS. This study investigated its prevalence in pain remission and improvement on functional in participants with CTS.

DISCUSSION:

Despite the fact that LLLT is one of the most well-known and extensively used modalities in physiotherapy, there is currently at least inadequate evidence to support its benefits. Only a few randomised controlled studies (RCTs) have explored use of such LLLT in treating the individuals with CTS, often with widely divergent method quality, and have unable to provide evidence of its effectiveness. Because only a confined number of publications were discovered using the search criteria, this systematic review did not provide enough evidence to explicitly recommend^{14,15}. Furthermore, based on the RCT studies included in the analysis, there is some evidence that LLLT therapies enhance pain alleviation and improvement in people with Carpal tunnel syndrome. Because some studies did not concentrate on a specific result, several publications were omitted throughout the comprehensive process of selecting a study. (Table 1). Table 2 summarizes the characteristics laser therapy in the trials included 16 In the Tikiz et al study, both pulsed Ultrasound therapy and LLLT found to have a major benefit in clinical parameters are provided 6. Milica Lazovic et al. encountered that the experimental group experienced poorer quality of life than the control group.⁷ In 2018, Thierry P Frank et al. determined that LLLT treatment is more successful as a single intervention in individuals with CTS, later which benefits of LLLT tends to wane.⁸ According to Zhi- Jun Lietal in 2016, after 3 months of follow-up for mild to moderate CTS, LLLT has found to improve the hand grip, VAS, and SNAP. Outcome measures have changed substantially between analyses⁹. Furthermore, no long-term follow-up was included in the research to identify any changes in outcome. Considering the number of limitations and the limited set of study material, a reliable conclusion was not available. Future research should address these limitations while also emphasizing the benefits of laser therapy.^{10,11}.

CONCLUSION:

The evidence states that there is reduced quality, and there is insufficient data to suggest any therapeutic impact of LLLT in treating CTS. Poor too much reduced quality evidence suggesting that LLLT has decreased effect in the treatment of CTS when given for short period, clinically pain reduced meaningful^{15,16}. In the management of CTS, there is inadequate data to endorse LLLT having better or worse effects than other nonsurgical therapy. Any additional LLLT study can be definite, blinded, and of high quality.

CONFLICT OF INTEREST: No conflict of interest.

SOURCE OF FUNDING: Nil

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FIGURE 1: Study selection strategy

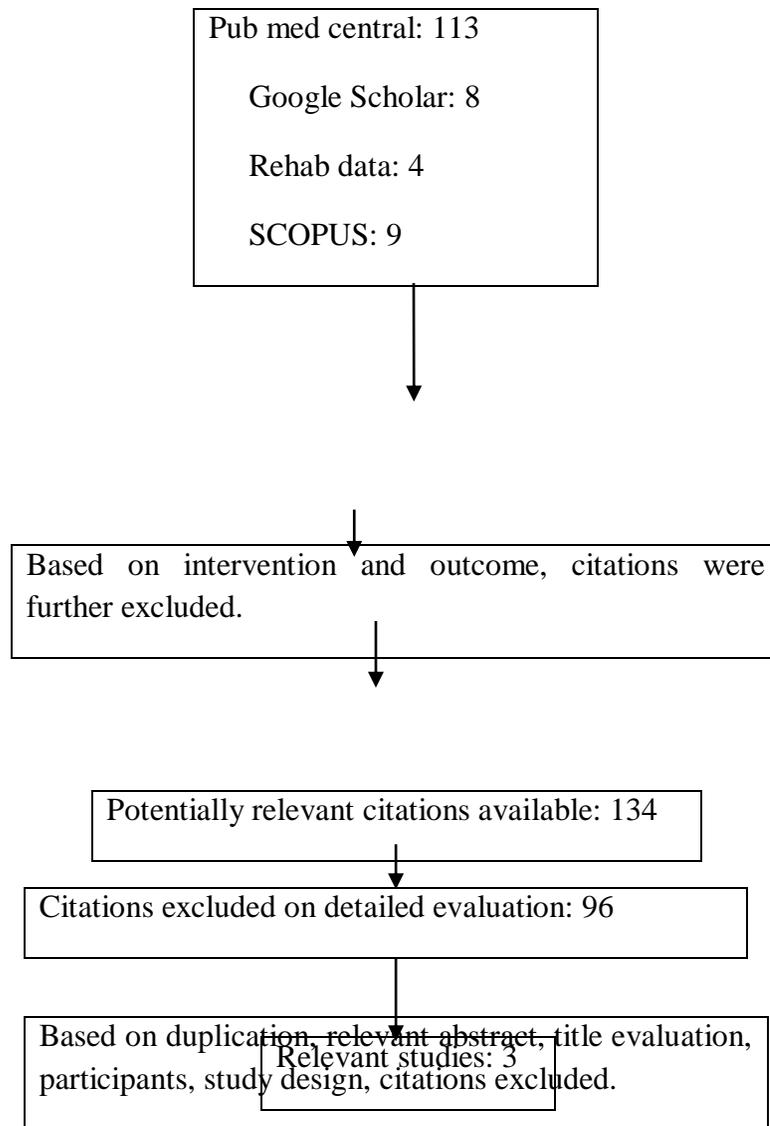


FIGURE 2: Cochrane risk of bias tool

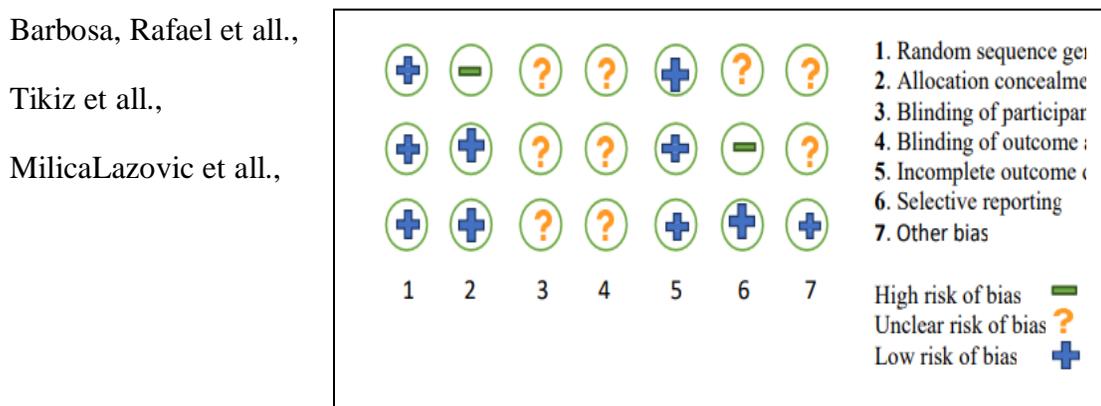


TABLE 1: Demographic data of the population

Author	Intervention group	Control group	Intervention vs. Control programme	Outcome scales	Outcome and Adverse effects
Barbosa, Rafael et al., ⁵	30 patients with age above eighteen years, clinical diagnosis of CTS	30 patients aged over eighteen years, clinical diagnosis of CTS	For 6 weeks, conservative management along night splinting, educating patients and low-level laser therapy (12 therapy sessions) VS For 6 weeks, conservative therapy as night splinting and patient education was used.	Pain visual analogic scale, Dynamometer, Pinch Gauge.	LLLT has established result as an intervention in patient with carpal tunnel syndrome. No clinically significant adverse effects.
Tikiz et al., ⁶	15 patients diagnosed with CTS were treated with LLLT.	15 patients diagnosed with CTS were treated with pulsed Ultrasound.	For three weeks, both therapies were used weekly five days. Practically and electrophysiological evaluations was done previously three, six, and twelve months following therapy.	Boston Questionnaire	Pulsed US therapy, LLLT used and found significant positive impact in parameters. No clinically significant adverse effects.
Milicaet al., ⁷	active laser group included 40 patients, 4 males and 36 females(61 hands) out of which 19 patients found to have unilateral. 21 patients found to have bilateral CTS. The patients' age ranged from 27 and 72 years.	placebo (sham) laser group had 39 patients (59 hands), out of which 34 females and 5 males, with unilateral 19, and bilateral CTS 20. The patients' age ranged from 30 and 67 years.	All were treated once daily for two weeks five times per week, then alternatively three weeks, for twenty sessions.	Assessment, including visual analogue scale (VAS) pain rating, Tinel's sign, and median nerve conduction studies (NCSs).	They showed decrease in pain than the control group. No adverse effects were found.

TABLE 2: Laser therapy characteristics of the included trials

AUTHOR	TYPE OF INTERVENTION USED	WAVELENGTH (nm)	Joules PER TREATMENT SPOT	MEAN OUTPUT POWER (mW)	SECONDS PER TREATED SPOT	NUMBER OF SPOTS TREATED	SESSIONS/ SESSIONS PER WEEK
Barbosa et al., ⁵	Gallium-indium-phosphorus-aluminum (AlGaInP) laser emitter	660	10	30	20	6	12/2
Tikiz et al., ⁶	Gallium-Aluminum-Arsenide (Ga-Al-As) device	830	1.5	30	60	5	15/5
MilicaLazovic et al., ⁷	GaAlAs diode laser	780	3.4	30	90	4	20/5