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Original Article

Clinical Efficacy of Low-Laser Therapy in the Treatment of Fascial Trigger Points: A Randomized Prospective Clinical Study

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ABSTRACT:
Aim of the study: The purpose of this study is to compare the efficacy of infrared light and laser therapy as myofascial pain treatment modalities (immediate or delayed effect). **Material and methodology:** 80 female patients with an age range from 16 to 50 years, selected from the out-patient clinic of the oral and maxillofacial department, faculty of dentistry, Cairo University; with myofascial pain or taut fascial painful trigger points were involved in this study from April 2022 to April 2023. 1st group was treated with low-level laser therapy while the 2nd group was treated with infrared lamp therapy. **Results:** immediate improvement in both groups, while in the follow-up period, the laser group showed more improvement in the pain and mouth opening measurements. **Discussion and conclusion:** Although our research has shown that these two techniques may relieve myofascial trigger points, there are limited clinical trials proving that they are beneficial, time-save, and drug-free. According to the literature, laser therapy is more effective as a non-surgical modality than any other injection technique. A vicious cycle of pain, muscle spasms, and more pain has been said to be broken by enhancing microcirculation through the utilization of laser therapy. This could improve the supply of oxygen to the cells in low-oxygen environments and aid in getting rid of waste products from cell metabolism.

Keywords: Laser therapy, Female, TMDs.

I. INTRODUCTION

In the orofacial region, myofascial pain syndrome with trigger points (TrPs) is the most frequent cause of non-odontogenic pain; Trigger points are identifiable as isolated skeletal muscular spasms, inflammation, and poor blood flow regions that commonly cause regional and referred pain upon testing, loss of function, disturbed sleep, and an overall reduction in the patient's quality of life [1]. Muscle discomfort in addition to exhaustion influences the physiology and performance of the muscle. Diminishing the activation rate, transmission speed, and sensitivity of motor

units, has a consequence on the jaw's operations and force. In addition to the bone changing attributed to mechanical pressure that is referred to as condylar degeneration. Accurate diagnosis, potential origin, symptoms, and signs should be the starting point for treatment. Treatment must begin with methods that minimize pain, restore performance, and enable patients to resume performing everyday tasks. Similar to different musculoskeletal conditions, TMD symptoms and indicators may go away on their own. It is unclear which symptom or sign will get worse as the condition progresses. However, it may be much better to keep away from unpleasant occlusal therapies or early surgical intervention. [2]. Reducing local and referred pain triggered by TrPs with an injection of substances including local anesthesia, botulinum toxins, corticosteroids, and saline solution is an efficacious technique. By relaxing the muscle and reducing pain, the needling effect itself that comes from these injections and the components employed assist in controlling chronic and active trigger points successfully. [3]. Low-energy laser therapy (LLT) can be described as a soft tissue laser because it emits little energy and does not affect the skin's temperature. Its principal influence revolves around the mechanism that controls light absorption. This soft laser offers a wavelength that varies from 630 to 1300 nm. Through direct irradiation, it improves tissues resulting in an analgesic and anti-inflammatory effect. Due to its impact on the mitochondrial respiratory chain, there has been an increase in vascularization and fibroblast production [4].

Infrared light encourages the synthesis of growth factors and the synthesis of extracellular matrix to aid in tissue healing. IR-related enhancements in the circulation of blood are capable of speeding up the healing of pressure sores and discomfort, alleviating muscle spasms, and improving sensory nerve conduction velocity. They also have the potential to increase endorphins, which are hormones that regulate pain but may also be influenced by other variables [5]. Although the exact mechanism of laser therapy's analgesic and anti-inflammatory effects is yet unknown, it is possibly explained by boosting the level of beta-endorphin in spinal fluid and enhancing the excretion of glucocorticoids in the urine, which function as regulators of beta-endorphin synthesis. The release of acetylcholine and histamine is inhibited, as is the production of bradykinin, and it lowers the threshold for pain under pressure by an electrolytic nerve fiber blocking mechanism. The bio stimulation effect may result from vascularization enhancement, metabolic activation, faster mitochondrial cellular respiration chain, and fibroblast production. [4]

II. MATERIAL AND METHODS

80 female patients with an age range from 16 to 50 years, selected from the out-patient clinic of the oral and maxillofacial department, faculty of dentistry, Cairo University; with myofascial pain or taut fascial painful trigger points were involved in this study from April 2022 to April 2023., patients were examined clinically, and radiographically (with panorama and/or MRI) patients to be sure there weren't any gross anatomical deformity in relation to the TMJ that may affect our study (to ensure the pain was of muscular origin), Figure (1).

Inclusion criteria: Myofascial pain is clearly evaluated, and there are one or more unilateral or bilateral taut painful trigger points in the temporalis and/or masseter muscles (with no prior history of invasive procedures on the affected muscles).

Exclusion criteria: patients with systematic situations that can affect our treatment (pregnancy, lactation etc.)

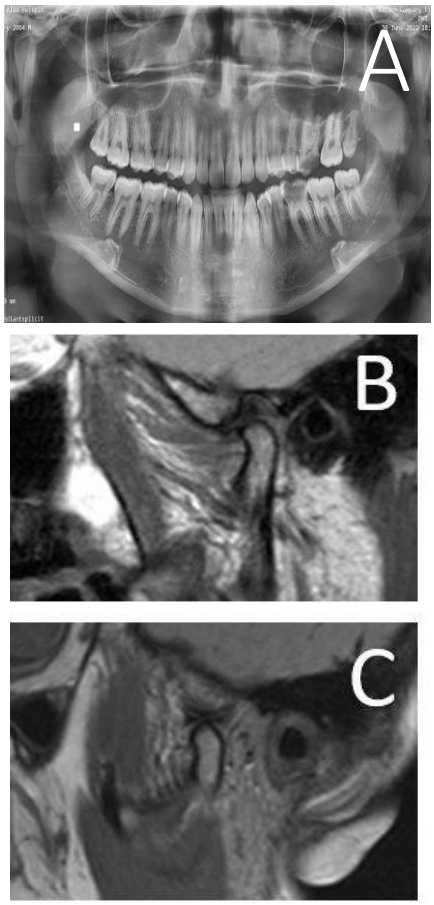

Figure (1): pre-operative panoramic and MRI radiographs to exclude any joint abnormalities

Patients were divided randomly into 2 groups (1st group was treated with LLLT, and the 2nd group was subjected to infrared light).

Intervention

A. Collecting information about the patients

1. History (name, sex, address, occupation, medical history, past, dental history, and history of our concerned chief complaint).
2. Conduct a comprehensive extraoral and intraoral clinical examination to rule out any occlusal disturbances, or internal derangement symptoms like clicking, and to locate the most painful points located on the TMJ lateral surface, including either the masseter or temporalis muscles.
3. A visual analog scale (VAS) was used for calculating pain grade right before our therapy. Patients were asked to describe the degree of discomfort/pain from zero to ten, the pain scale read "no pain" and "the greatest pain possible.
4. Patients were asked to stop using occlusal splints in addition to stopping any medications before beginning this treatment.
5. Based on the types of treatments utilized, the patients were allocated at random to either Group I (laser therapy) or Group II (infrared light therapy).

B. Treatment

- **1st group**: the treatment was performed using HULASER K2 mobile system (Diode Soft Tissue LASER, Korea, 980 nm, 3.5w CW/6.0w) (Fig 2); a 7 W laser beam with a 2.8 cm2 spot size transmitted radiation continuously at an intensity of 960 nm. Each application lasted 3 minutes (24 s per application point). For ten days, the session was repeated every two days. The laser was applied extra orally to certain points: pre-auricular, mastoid, angle of the mandible, temporal, and zygomatic. Both the surgeon and the patient were in a position away from the laser beam and wore protective eye goggles to prevent eye adverse effects. The laser device cold has been away from the skin to avoid burn to the skin.

Figure (2): HULASER K2 mobile system

- **2nd group**: patients' trigger points were exposed to an infrared heater portable lamp in the same previously mentioned painful trigger points of the face with the same number of sessions (45cm away from the face to avoid overheating and burn) as the laser group with the same precautions.

C. Assessment

The following parameters were evaluated at three distinct times: prior to therapy, following the conclusion of treatment, and three months later.

1. The patient used the VAS to estimate their own subjective pain severity (our main primary outcome).
2. Maximum mouth opening (MMO) and Lat. excursions were recorded (fig 3)

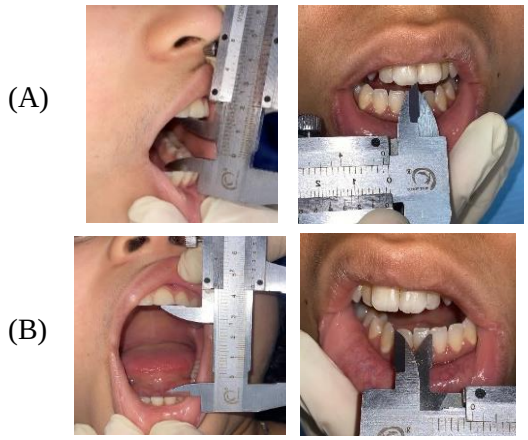

Figure (3): showing MMO & lateral excursions; (A) preoperative, (B) postoperative in both groups immediately

D. Statistical analysis of the data

Data will be decoded, tabulated, and statistically analyzed using SPSS package for windows (statistical package for social science) program version 20. Numerical data will be described as mean and standard deviation or median and range, as appropriate.

III. RESULTS

80 female participants in this study ranged in age from 16 to 50 who had been diagnosed with TMD on the basis of RDC/TMD Axis I and had failed to get better with previous conservative treatments.

Table (1): TMJ dysfunction (prior to therapy)

	Patients no.	%
Muscle pain	80	100
Mouth opening limitation	70	87.5

In both groups, the only side effects seen were minor soreness and redness at the exposure site, which vanished within 24 hours. After the treatment plan was finished, the majority of patients experienced a significant reduction in pain intensity that had been sustained for three months; Prior to treatment sessions, the median (Min. - Max.) VAS score was 9(8–10); however, this value dramatically fell to nearly Zero shortly after treatment & three months (table.2). Maximum mouth opening (MMO) and lateral jaw motions have significantly improved. After treatment sessions, the average maximal mouth opening was 27.89 ± 2.47 mm at the start of the treatment, improvement of MMO was recorded till reaching 41.44 ± 2.47 mm in either group; and improvement of lateral excursions was recorded till reaching 7.5 ± 2.47 mm (for left side) and 8.44 ± 2.5mm (for the right side) (with statistically significant findings in the follow- up period).

Table (2): Muscle pain, maximal mouth opening and lateral extrusion scores of both groups

	Laser Group	Infrared Group	P value
Muscle pain score	Pre: 8-10 Immediately: 0-3 After 3 months: 0-5	Pre: 8-10 Immediately :0-4 After 3 months: 0-5	<0.001
Maximal Mouth opening	Pre: 27.89 ± 2.47 mm Immediately: 41.44 ± 2.47mm After 3 months: 42.44 ± 2.47mm	Pre: 26.89 ± 2.47 mm Immediately: 43.44 ± 2.47mm After 3 months: 33.44 ± 2.47mm	<0.001
Lateral excursions	Right Ex: Pre: 4.9 ± 2.5 mm Immediately: 7.44 ± 2.5mm After 3 months: 7.44 ± 2.5mm left Ex: Pre: 4.75 ± 2.5 mm Immediately: 8.1 ± 2.5mm After 3 months: 7.5 ± 2.5mm	Right Ex: Pre: 3.97 ± 2.5 mm Immediately: 6.45± 2.5mm After 3 months: 6.44 ± 2.5mm left Ex: Pre: 4.67 ± 2.5 mm Immediately: 7.5 ± 2.5mm After 3 months: 6.98 ± 2.5mm	<0.001

IV. DISCUSSION

In the orofacial region, myofascial pain syndrome with trigger points (TrPs) is the most frequent cause of non-odontogenic pain; Trigger points are identifiable as isolated skeletal muscular spasms, inflammation, and poor blood flow regions that commonly cause regional and referred pain upon testing, loss of function, disturbed sleep, and an overall reduction in the patient's quality of life [1].

The appropriate diagnosis and treatment of TMD may be difficult due to the fact that is still a complex condition that is difficult to clearly describe. Physical modalities keep on being a key component for its conservative management. Lately, TMD pain has recently been successfully treated through low-level laser therapy for better TMJ functions [6]. Regarding the frequency of LLLT, the total number of sessions of therapy, and the dosage of laser treatments, there is a lot of debate in the literature. Some therapists advised administering the laser beam only to the pain areas and scheduling eight stimulations with two sessions per week. While ten sessions, with two sessions every week, are advised. The final results of the research are positive in that they demonstrate a significant improvement in myofascial pain in individuals who received laser therapy. Both in regard to objective criteria including maximum mouth opening as well as in terms of subjective aspects like pain scores. These analgesic plus biostimulating effects of laser treatment can enhance joint functioning characteristics [4].

The efficacy of infrared light red appeared as detoxing body process, pain alleviation, reduced muscular tension, relaxation, enhanced circulation, skin cleansing, immune system strengthening, and blood pressure reduction; but their action on myofascial pain still has not been studied a lot in papers. It acts as an easy way for immediate muscle relief; The action of the mitochondria within cells is enhanced by infrared therapy, which promotes the creation and repair of new muscle cells and tissues. In other words, after muscle damage, infrared light may accelerate the process of recovery [5].

Our findings confirmed those of Palano et al., [1] who revealed that LLLT has a therapeutic effect on all forms of TMJ conditions like pain, clicking, limited mouth opening, and functional improvement; suggesting that these findings may be related to the anti-inflammatory characteristics

of laser therapy. Furthermore, the study of Bezzur[2] revealed that LLLT had a positive impact on the TMJ movements, and they stated this occurs as a result of the laser's anti-inflammatory capabilities and due to an alteration in secondary muscle inhibition that occurs as a result of the joint's sensory receptors being overactive. While other studies stated that although LLLT can improve patient comfort since it is quick, easy, safe, non-invasive, well-tolerated, and has few to no side effects; this effect could be transient and disappear after a short period [8-10]. These greatly different outcomes found in the literature could be explained by variations in the therapy regimes, wavelength, pulse frequency, power output, and energy dosages, along with the sites of application and the total number of application points of the laser used. All these variations make comparison extremely challenging [10].

LLLT is a simple, reliable, straightforward, timesaving, free-from-drugs, well-tolerated technique that promotes patient comfort as well as has few to no adverse effects. In this study, there were certainly no negative outcomes. With little to no adverse consequences, LLLT has beneficial therapeutic effects on temporomandibular myofascial syndrome symptoms that are both subjective and objective. [11-13]. To accurately assess the efficacy of laser therapy in the treatment of TMDs and to standardize the treatment technique, larger sample studies, and double-blind random experiments with different types of control groups (such as other injection materials) are recommended.

Conflict of interest: No conflict of interest.

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Ethics: This study protocol was approved by the ethical committee of the faculty of dentistry- at Cairo University on 25th April 2023.

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