

**Efficacy of Photobiomodulation Therapy Using 980nm Versus 635nm Diode Lasers in the Management of Myofascial Pain Syndrome (LLLT-MPS\_sEMG)**

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## Introduction

Temporomandibular disorders (TMDs) are the most common non dental orofacial pain influencing tempomandibular joint (TMJs), orofacial muscles, or both.(1)

The Most common symptom is pain, which is generally localized to the masticatory muscles, pre-auricular area and temporomandibular joint.(1,2)

The significant clinical signs and symptoms of TMDs are muscle/TMJ pain, TMJ sounds, limitation, deviation, or deflection of mandibular movements(3)

The prevalence of TMDs is higher among people in the 25-45 age range, women are more affected, and psychosocial problems cause higher prevalence and greater intensity of TMD symptoms.(3)

Surgical approaches are only indicated in patients without any improvement following conservative treatments after at least six months and those with severe disability.(3)

IN DENTISTRY, Low-level laser therapy (LLLT), recently named photobiomodulation which has been

Photobiomodulation therapy (PBMT) has an anti-inflammatory effect due to the light absorption in intracellular photo-acceptors and modulation of cell responses. Photo biomodulation therapy emitting infrared spectrum.(4,6) Photobiomodulation therapy (PBMT) increases the blood microcirculation, vascularization, and proliferation of the fibroblasts cells, ATP production, as well as reducing edema and the level of cyclooxygenase-2 (COX2) and prostaglandin E2 (PGE2) as a result of increased lymphatic flow.(4,5)

RECENTLY, Evaluation of the effect of photobiomodulation therapy depend on pain intensity, maximum mouth opening(MMO), lateral movements(LM), protrusive movements(PM), pressure pain threshold, electromyography activity and TMJ sounds in patients with TMDS.(3,4,5)

Photobiomodulation therapy has been used to relieve pain for temporomandibular disorders in combination with conventional therapies such as physiotherapy exercises and occlusal splints. Published outcome data report diode lasers with a wavelength of between 650 and 1000 nm, with fluences of between 1.5 and 140 J/cm<sup>2</sup>. Treatments are usually repeated two or three times a week until the symptoms have disappeared.(7)

## Review of literature

Nima Farshidfar in 2023 , Effects of PBMT on the alleviation of pain and improvement in Maximum mouth opening. Using the infrared diode laser with a wavelength ranging between 780-980 nm, an energy density of <100j/cm<sup>2</sup>, and an output power of ≤500 mW for at least six sessions of treatment seems to be a promising option for treating mentioned TMDs signs and symptoms.(1)

Ahmed Fadhel Al-Quisi in 2023, Both LED light and LASER therapies could effectively relieve pain associated with myogenic TMD as there were no important differences between their outcomes. However, the biosafety and lower cost of the LED light device compared to the LASER should also be considered. The LED light device used in the current study had a wavelength of 660 nm (red light) with a power of 1.6 Watt, which is equivalent to 1.6 J of work per second. The Diode LASER had the following parameters: wavelength = 810 nm, 2.5 Hz, and power = 1 Watt.(23)

Nahla Mahmoud Awad in 2023, A laser group showed more improvement in the pain and mouth opening measurements infrared lamp therapy. 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. Diode Soft Tissue LASER, , 980 nm, 3.5w CW/6.0w .a 7 W laser beam with a 2.8 cm<sup>2</sup> 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: preauricular, mastoid, angle of the mandible, temporal, and zygomatic.(6)

Mohammed Nadershah in 2020, Photobiomodulation therapy proved to be an effective short-term therapeutic modality for myofascial TMD pain. It is non-invasive, easy to apply with no systemic side effects. Its long-term effect and its effect on different subtypes of TMD need further investigation. Patients with unilateral TMJ and masticatory muscles pain during function were recruited and divided into two groups: a control group that received a sham laser treatment every 48 h for 10 days and a test group that received the same frequency of treatment to deliver a dose of 257 J per treatment and a total dose of 1285 J for the entire treatment. For the test group, a diode laser was applied using the Ezlase 940 device. A 7 W laser beam with a 2.8 cm<sup>2</sup> spot size emitting radiation continuously at a wavelength of 940 nm was applied by the therapist extraorally and at a 2 cm distance from the skin to 5 points at the temporal (center of Temporalis muscle), zygomatic (origin of Masseter muscle), angle of the mandible (insertion of Masseter muscle), pre-auricular, and mastoid areas. Each application lasted 2 min (24 s per application point) so that each patient received approximately 300 J of energy per treatment .(30)

Sabrina Araújo Pinho COSTA in 2017, treatment of masticatory muscles, The photobiomodulation therapy (830 nm) acted effectively on the analgesia of the masticatory muscles in the participants with TMD, based on muscular palpation, but was not effective regarding the criteria for mouth opening range. Further research is needed to evaluate the long-term effects of PBMT (830nm) on the treatment of patients with chronic pain from temporomandibular disorders.(31)

### Aim of the study

To assess the effect of low level laser therapy (LLLT) to relieve pain in myofacial pain syndrome (MPS), caused by fatigue of temporalis and masseter muscles, by using 980nm diode laser, and compare between diode laser 980nm and diode laser 635nm

### Materials and methods

#### Patient assignment and blinding:

30 PATIENTS. Divided in to 2groups.

Comparison between two groups , First one, By using diode laser 635nm (flat top handpiece)

And other group by using diode laser 980nm (flat top handpiece).

The hand-pieces fixed at distances of 3 mm and 15 mm from the power meter, only the FT profile hand-piece had a constant power output, which was comparable to the contact mode.

Introsion criteria:-patients with Tmds due to stress,medically free, not to resort to self-medication during the study period.

Extrusion criteria:-patients with bruxisms, erosions,medically free,diabetics

#### Pico:-

Population:patients with myofacial pain.

Intervention:grouo1,using diode laser 635nm

Comparison:group2,using diode laser 980nm

Outcome:primary outcome:relief pain

Secondary outcome: maximum mouth opening(MMO), lateral movements(LM), protrusive movements(PM).

### The clinical procedure:

In all groups, the painful points were determined at each assessment interval. Bilateral muscles including masseter (origin, body, and insertion), temporal (anterior, middle, posterior), tendon of temporal, and insertion of internal pterygoid as well as temporomandibular joints (TMJs) at rest and function were palpated and the painful points were recorded in the patient's folder.

Group 1 (low-level laser therapy): patient received laser treatment with diode laser 635nm with flat top hand piece Applied on the trigger points.

Group 2 (low\_level laser therapy): patient received laser treatment with diode laser 980 nm with flat top hand piece Applied on the trigger points.

The laser was applied two times a week for 5 weeks.(23,18)

Both the patient and the operator wore protective goggles during treatment.

The patients in all groups were asked not to resort to self-medication during the study period.

### Patient assessment:

The patients were evaluated before treatment ,after laser applications ,at the end of treatment , and 1 month after the laser applications.(18)

Evaluation of the patient is determined by pain intensity, maximum mouth opening(MMO), lateral movements(LM), protrusive movements(PM), pressure pain threshold, electromyography activity and TMJ sounds in patients with TMDS.(1,3,4,5)

At each assessment interval, the amount of mouth opening and the range of protrusive and lateral excursive movements of the jaw were measured and recorded. To measure mouth opening, the patient was asked to open the mouth at both "maximum pain-free" and "maximum possible" conditions.

The vertical interincisal distance was then measured with a digital caliper and recorded in millimeters in patient's folder.

The right and left lateral jaw movement was measured in millimeters by detecting the horizontal distance between the midpoints of the upper and lower central incisors.

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.

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