INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 21, No. 1, p. 216-220, 2022

RESEARCH PAPER OPEN ACCESS

The effect of 980 nm diode laser in relieving temporomandibular joint pain: a clinical study

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Key words: Diode laser, Temporomandibular joint, Dental clinic, Pain.

http://dx.doi.org/10.12692/ijb/21.1.216-220 Article published on July 28, 2022

Abstract

There are a lot of people suffering from temporomandibular joint pain and laser therapy is developing and gives promising results. This study aimed to explore the effect of diode laser on temporomandibular joint pain. The method is basically based on irradiating the temporomandibular joint area by using a 980-nanometer diode laser and recording the condition of the patients before and after laser therapy. 10 persons visited the dental clinic suffering from a variant degree of pain in the temporomandibular joint area. All those patients were subjected to the same laser protocol. All the patients came to the dental clinic again after one week to evaluate their condition. The diode laser showed good results in relieving the pain with about 60% of the patients feeling better. Based on the results of this study, the diode laser was a good choice for relieving temporomandibular joint pain.

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Introduction

The temporomandibular joint consists of bilateral freely moving (diarthrodial) temporomandibular joints (TMJs). Each joint is formed by a mandibular condyle head and the related temporal cavity (glenoid fossa and articular eminence), Fig. 1. The TMJ and its structures have an important role in directing the mandibular movement and distributing forces produced by everyday functions, such as speaking, chewing and swallowing (Murphy *et al.*, 2013).

There are a lot of temporomandibular joint disorders, including many problems affecting the anatomy and functional properties of the TMJ. Factors contributing to TMD complexity are related to dentition, clenching, and other related systems that frequently provoke symptoms of muscular, articular, and periarticular pain (Ismail *et al.*, 2016). TMJ pain is a type of orofacial pain, defined as a pain manifested in the face or oral cavity, including such disorders as TMD, which are a major cause of nonodontogenic orofacial pain. TMD has considerable prevalence, with a significant impact on physical and psychosocial factors. Its prevalence has been reported to be between 3.7% and 12% and is three to five times more frequent in women (Resende *et al.*, 2020). TMD also contributes to a high proportion of socioeconomic costs, which are usually associated with comorbidities, such as depression and other psychological factors. Also, the loss of work and work productivity is a major issue to consider in TMD patients being treated early on, and it requires significant public education (Li Dion *et al.*, 2021).

Materials and methods

Diode lasers from Pioon technology, China, were used in this study (Fig. 2, Table 1). 10 persons were subjected to this study. They came to the dental clinic suffering from varying degrees of pain (mild, moderate, severe) in their TMJs, either unilateral or bilateral. All of them had no previous medical treatment (i.e., analgesics, appliances) and were visiting the clinic for the first time. The age of those persons (males and females) ranged from 23-50 years old. The treatment was done without any anesthesia or sedation. The Laser parameters used (for all patients) were 980-nanometer wavelength in continuous mode, 4W peak power (Fig. 3) delivered in 400 nm optical fiber mounted to a special TMJ hand piece (Fig. 4). The treatment time for each patient was 5 minutes, twice weekly. The laser handpiece was directed at 90 degrees to the tmj area and moved in a circular motion around the joint (Fig. 5).

Results and discussion

All 10 patients experienced significant pain relief after 10 days. Four patients said that the pain completely disappeared after one visit, two patients needed a second visit and two needed a third visit (Fig.6).

Table 1. Specification of the Laser device.

No.	Property	Unit
1	Brand Name	PIOON
2	Place of Origin	China
3	Power Source	Electric
4	Power	10 W
5	Voltage	220 V
6	Frequency	50 Hz

TMJ disorders are highly frequent among patients, especially with increasing daily life stresses. Laser therapy is an increasing demand these days due to its simplicity and the good results it gives. Laser devices are widely spreading these days with a lot of options and already installed parameters to facilitate their use. A laser is light with special properties produced by an electrical machine and has a lot of medical applications (Maiman 1960). Low-level laser therapy is the therapy that is based on using a laser beam with low energy to enhance tissue healing and regeneration (Markolf H, 2007).

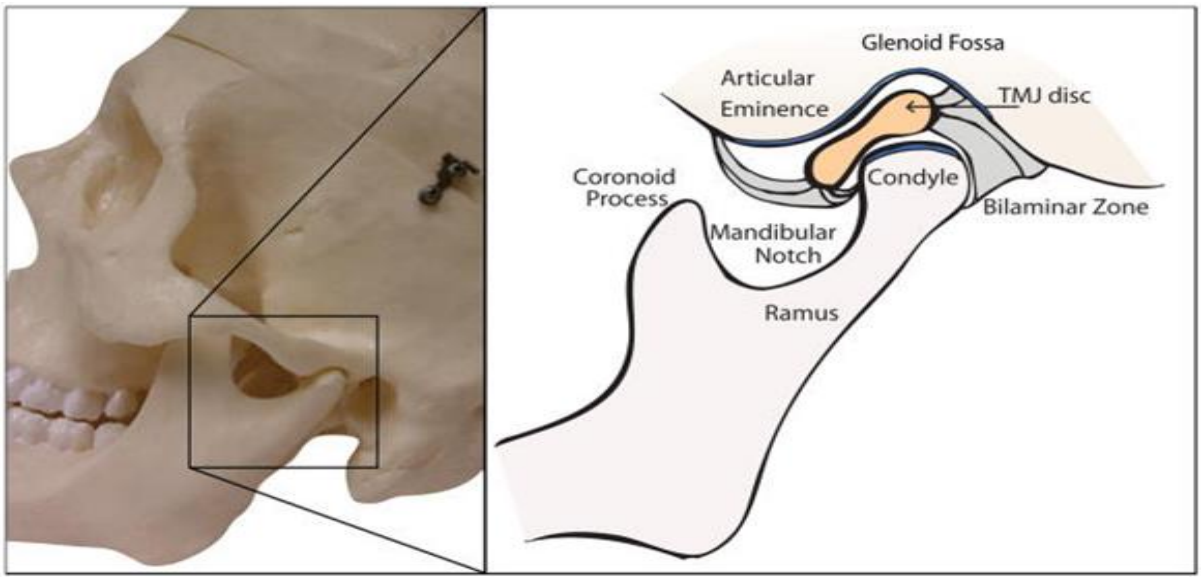

Fig. 1. Temporomandibular joint articulation.

Low-level laser therapy can affect the living tissues by photochemical effect, where the laser light makes chemical changes inside the tissue (Chellappa *et al.* 2020).

Fig. 2. Pioon laser device.

Fig. 3. Laser parameter.

Low-level laser therapy works by many mechanisms, including Vasodilatation, stimulating releasing of endogenous opioids, increasing pain threshold, decreasing inflammation, increasing blood microcirculation, increasing cellular reproduction and enhancing tissue regeneration (Ahrari *et al.*, 2014).

Fig. 4. TMJ hand piece.

Simel Ayyildiz, 2015 uses a near-infrared diode laser to treat a patient suffering from limited mouth opening and pain in TMJ region. He used a 685 nm laser wavelength with 25mW power for 30 seconds; three times a week for one month and the result was significant pain relief and increased mouth opening from 35 to 42 mm. Nabeel Sayed *et al.*, 2014. Irradiate the TMJs of twenty patients for two weeks (three times per week) using gallium arsenide 904 nm diode laser and statistically significant results were achieved in all study parameters.

Fig. 5. Laser hand piece application and movement.

Esshagh Lassem *et al.*, 2008 evaluate the effectiveness of a 980 nm laser in the management of TMJ disorders on 48 patients (80 Hz, 6 J) and check the results immediately, after 2 days, and after 4 days. He found that "Low-level laser therapy (980 nm) was effective in the management of TMD signs and symptoms and induced considerable reduction or elimination of pain severity and clicking."

Laís Valencise Magri *et al.*, 2017 tested the effectiveness of low-level laser therapy 780 nm on pain intensity associated with TMJ disorders for 148 patients and the result was a noticeable reduction in pain intensity.

Lia Alves DC *et al.*, 2008 conducted a study to figure out the effectiveness of an 830 nm diode laser. The study was divided into two groups, the placebo group and the laser group. He found out that "the 830 nm diode laser, the low-level laser was not effective in the treatment of TMJ pain when compared to the placebo group".

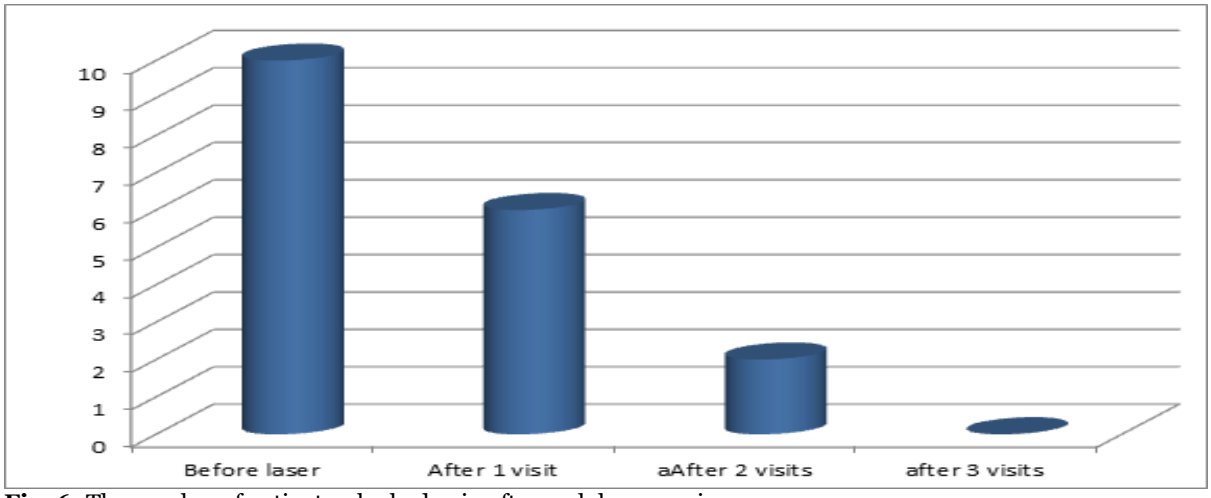

Fig. 6. The number of patients who had pain after each laser session.

Conclusion

The findings indicate that the low-level laser therapy of 980 nm is very effective in reducing the pain intensity and relieving the symptoms of TMJ pain either from the 1st session of laser therapy, second session, or third session.

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Author disclosure statement

No competing financial interests exist. Reprint requests sent to: Hareth A. Alrikabi. National University of Science and Technology, College of Dentistry, Dhi-Qar, Iraq.

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