

Treatment of Myogenic Temporomandibular Joint disorders with Diode laser and Pharmacotherapy (comparative study)

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ABSTRACT— Myogenic Temporomandibular disorder is considered a general condition with patients visiting dental clinics. Etiology due to malocclusion, mechanical trauma, psychological stress, and stroke parafunctional activity. The current study was aimed to evaluate the therapeutic effects of diode laser at 940 nm compared with pharmacotherapy. Forty patients were diagnosed with pain in Temporomandibular Joint region and limited mouth opening have divided into two groups: first group received six-session laser therapy(n=25) for two weeks and second group received Indomethacin, Diazepam, and Paracetamol-Orphenadrine citrate (n= 15) for two weeks. Pain Intensity and maximum painless mouth opening were measured. Collection of results were done pre-treatment, post-treatment, and followed for 6 months. The Data had statistically analyzed using Shapiro- Wilk's test and Quade test using SPSS Statistics V. 20. The significant difference was $p < 0.05$. The laser therapy showed better maximum painless mouth opening during 3 months with less recurring symptoms of disorder.

KEYWORDS: Temporomandibular Joint, Diode laser, Maximum mouth opening, Muscles of mastication.

1. INTRODUCTION

Temporomandibular disorder is a clinical term involving the signs and symptoms refer to illness of the temporomandibular joints (TMJ), and related muscular and bony structures [1]. TMD is characterized by functional abnormalities and/or musculoskeletal pain at the masticatory muscles. Pain can be mild, moderate, or severe, also constant or intermittent, intensive during mastication, and it is frequently associated with jaw restricted movements result mouth opening limitation [2]. The main etiologic factors that lead to TMDs are the malocclusion, trauma, emotional and psychological stress, and stroke parafunctional activity [3]. Different modes of treatments have been applied to overcome this condition. Dental lasers are raising the temperature in the target by photothermal interaction, which is within the influence of safety for the tissues and helps to relieve muscle spasm and enable it to function normally [4]. Low Level Laser is used to improve and repair the functions and relief pain of muscles by reactivating the role of mitochondria in the production of ATP, which lead to restoring normal cell and tissue functions [5]. Laser therapy effects nerve cells by blocking pain signals transmitted. by these cells. to the brain. The pain blocking mechanism is represented of the production of high levels of pain killing chemicals such as endorphins and enkephalin from the brain and adrenal. gland. Laser therapy attacks muscle trigger. points on a non-invasive basis providing. musculoskeletal pain. relief [6]. Another benefit is acceleration of angiogenesis, which causes temporary vasodilatation [7]. In 1998, ND: YAG low power laser was used in treatment of TMD'S. Although defocused mode causes significantly decreased pain, and good improvement in mouth opening [8]. In 2007, He-Ne laser therapy in the treatment of TMD was applied. All cases showed

low improvements in pain relief during function [9]. The wavelength 660 nm (InGaAIP visible red light) had less effect on pain reduction in patients with myofascial pain dysfunction [10]. From 1990 to the present, there have been many attempts by scientists to treat the pain of the musculoskeletal joint by laser diode. In 2015, study by Chen evaluated pain and functional outcomes after LLLT for TMJ pain, research provided feedback on pain, measured by a Visual Analogue Scale. They found significantly better functional mouth opening [11].

2. MATERIALS & METHODS

2.1 Subjects

This study is designed to suit the skin color of most segments of Iraqi society (tan skin), since it included forty patients (40) patients who visited the dental clinic at the Institute of Laser for Postgraduate Studies at University of Baghdad and Alwasitty Teaching Hospital with the pain in TMJ region and limited mouth opening aged between 25 & 54 years. Selected individuals were examined clinically within the required criteria. All patients were assigned into two group, group A: laser therapy patients (n=25), and group B: pharmacotherapy patients (n=15). All patients have been asked subjectively to the intense of pain on VAS. The measurements were used to evaluate the mouth opening took by Digital Vernier (figure 1). Also the trigger points on each muscle were determined Inclusion criteria were applied in the selection of patients. OPG was be taken to exclude the undesired cases and leaving the other dental and surgical aspect out of this study.



Figure 1: Using of Digital Vernier before and after treatment.

2.2 Diagnosis of myogenic TMD's [12, 13].

It is characterized by clinical signs of malfunction or pain occurring simultaneously or independently:

- the temporomandibular joint pain
- difficulty opening and/or closing your mouth
- pain of the masticatory muscles (by mastication or palpation)
- anomalies in mandibular movements (shifting unilaterally)
- signs and symptoms are associated with orofacial pain and/ or problems.
- Earache or headache

Masticatory muscles defects associated with pain, and the myofascial bands look like be taught and concentrated trigger points and may progress to tendonitis. Masticatory muscles dysfunction may occur in isolation, or in order to other TMJ disorders. The most common etiology is parafunctional behaviour that hurts the muscles of mastication, and cause local irritation and inflammation [14].

2.3 Criteria [15]

To obtain the correct outputs for this study, certain criteria were applied in the selection of cases.

2.3.1 Inclusion criteria

- Pain in TMJ region and tenderness in masticatory muscles.
- Reduction in mouth opening (under 40 mm).
- No systemic and hormonal diseases.
- Patients aged between 25 and 54 years old.

2.3.2 Exclusion criteria

- Complicated conditions of capsular disc dislocated, injury, and tumours.
- Pain of dental origin (pulpitis, periapical cyst)
- Pain of oral lesions (types of ulcers)

2.4 Protocols

2.4.1 Laser therapy protocol

Placing the therapeutic handpiece over the painful area. Selected settings as in the pilot study, and started the treatment by activating the laser through the footswitch. At 3 cm distance over the skin surface, and duration of 10 seconds laser exposure. the same protocol is repeated for the other regions (figure 2). Deep tissue handpiece is reusable and equipped with a disposable non-sterile protective shield for single patient use. The selection of laser power was from the control panel of the device also these parameters were effective during the laser therapy session after pilot study was achieved: Average Power (4 W), exposure time (10 seconds) for each trigger area, Power density (0.566 W/cm²), Spot size= 3 cm, and Dose (5.66 J/cm²) with defocused mode.



Figure 2: Laser session

2.4.2 Pharmacotherapy group

In the second group, 15 patients received three types of medication are used to treat the pain and inflamed muscle tissues associated with myogenic TMD. By this study, effect of Indomethacin, Diazepam, and combination of Paracetamol- Orphenadrine citrate have been evaluated during 6 months.

Table 1: Schedule of drugs used in the study 16,17,18,19

Medication	Class	Dosage
Indomethacin	NSAID	50 mg /three times per day
combination of Paracetamol- Orphenadrine citrate	Analgesic–M. relaxant	2 tab /three times per day
Diazepam	Benzodiazepines	2 mg three times per day

3. RESULTS

3.1 Pain scores

The results have been taken during three months, since the pain reduction and increasing of maximum mouth opening were significantly different from the results before the treatment session.

Table 2: Descriptive and statistical test of pain scores among groups and periods.

Group	Statistics	Before Treatment	After treatment	1 month follow up	3 months follow up	Quade test	Sig.
Laser	Mean	6.68	0.56	0.68	0.92	47.197	0.000 HS
	±SD	1.03	0.77	0.75	0.76		
	Median	7.00	0.00	1.00	1.00		
	Min.	5.00	0.00	0.00	0.00		
	Max.	8.00	2.00	2.00	2.00		
Pharma	Mean	6.67	2.00	1.80	2.20	25.304	0.000 HS
	±SD	1.18	1.00	0.68	1.08		
	Median	7.00	2.00	2.00	2.00		
	Min.	5.00	0.00	0.00	0.00		
	Max.	8.00	4.00	3.00	4.00		

Analysis of results after treatment and follow-up shows how pain was reduced significantly (figure 3).

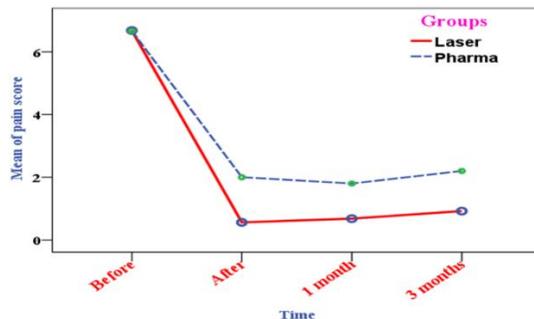


Figure 3: The mean of pain score in two groups during different periods

Pain scores with laser therapy group are better than pharma groups with significant difference.

3.2 Mouth opening

Cases in both groups have been subject to several periods of observation.

i. Evaluation at end of treatment (2 weeks)

By using model of increasing mouth opening with repeated measure, the main effect of time has a highly significant effect on mouth opening while the interaction between time and group has no effect (table 3).

ii. Follow-up of patients after one month

Many patients with a decrease in the non-painful mouth opening were observed (table 3).

iii. Follow-up of patients after three months

The number of patients with reduction in the non-painful mouth opening were increased (table 3).

Table 3: Statistical test of treatment groups within each period on maximum mouth opening.

Time	Group	Min.	Max.	Mean	±SD	Time	
						F	Sig,
Before	Laser	24.50	35.90	29.62	3.63	675.74 1	0.000 HS
	Pharma	24.70	36.00	29.85	4.05		
After treatment	Laser	40.10	53.20	46.00	4.01		
	Pharma	40.20	51.00	45.08	3.02		
1 month	Laser	40.10	53.00	45.40	3.68		
	Pharma	40.50	50.00	44.66	2.58		
3 months	Laser	40.10	52.00	44.62	3.33		
	Pharma	41.00	49.30	44.26	2.41		

Results in this table show the amount of increase in the mouth opening in both groups after treatment then it will decrease with highly significant change.

3.2.3 Side effects

Several side effects had observed during treatment; numbness, dry mouth, dizziness, drowsiness, and each according to their group.

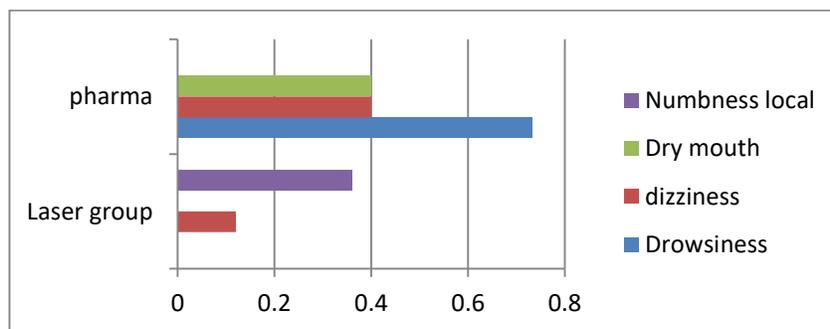


Figure 4: Mean of the most common side effects following the treatments.

4. DISCUSSION

Laser is mode of treatment provides a therapeutic and non-invasive way to treat pain, spasm of muscles and achieve a topical heating effect to increase your blood circulation. There was a significant reduction in the pain level when the measurements obtained after treatment period. The laser treatment group showed a greater improvement of maximum painless mouth opening than the pharmacotherapy group, with a statistically significant difference. It was useful that the anti-inflammatory and analgesic effects of laser light occurred in the target tissues. The number of patients who suffered side effects with laser sessions is less than the number of patients with the medication receiving group. Pharmacotherapy causes slight side effects but is considered within safety limits.

5. CONCLUSION

The dose of 5.66 J/ cm² of 940 nm diode laser (4W for 10s and 2.25cm² surface areas) with defocusing mode, it is totally desired effect and comfortable to patient. There is no harmful elevation in temperature, and no thermal damage with deep tissue handpiece. Laser is effective in the management of acute, and mild musculoskeletal conditions, and it is recommended for management of such disorders.

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