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# Low Level Laser Therapy Versus Pharmacotherapy and Inter Occlusal Splint Therapy in Improving Myofascial Pain Disorder Syndrome

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# Low Level Laser Therapy Versus Pharmacotherapy and Inter Occlusal Splint Therapy in Improving Myofascial Pain Disorder Syndrome

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## *ABSTRACT*

**Purpose:** The present study was carried out to evaluate and compare the clinical effect in a short term of three conservative treatment methods for myofascial pain disorder syndrome (MPD): pharmacotherapy, inter occlusal splint and low level laser therapy (LLLT). **Subjects and Methods:** The present study was applied on thirty (n=30) females patients which suffered from myofascial pain disorder syndrome (MPD).They were selected for this study with age ranged from 17-45 years. Patients were divided equally and randomly into three groups; Group I : were treated by LLLT, Group II were treated by oral appliance therapy and Group III were treated by pharmacotherapy. The outcome variables were pain score and the maximum interincisal opening (MIO). Pain score was assessed by using Visual Analogue Scale (VAS); both variables were assessed preoperatively, postoperatively at the first month weekly, three months, and six months. **Results:** VAS scores decreased and MIO increased gradually throughout the follow up durations at first, third, and six months after treatment in all groups ($P < 0.05$). Although there was a difference between groups I, II and III, however, the difference was not statistically significant. **Conclusions:** low level laser therapy can be considered as a suitable and non-invasive treatment alternative for MPD. Also it was effective, had showing promising results and can be used as treatment of MP. LLLT shows its effects in a short term duration so it can be considered as a treatment of choice

***KEYWORDS***

*Temporomandibular disorders (TMDs), Myofascial Pain disorder, Laser*

## INTRODUCTION

Masticatory muscle is one of the main systems in the body, and it is responsible for mastication, swallowing, and speaking[(1)].

- Paper extracted from Master thesis titled "Low Level Laser Therapy versus Pharmacotherapy and Inter Occlusal Splint Therapy in Improving Myofascial Pain Disorder Syndrome"

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Temporomandibular joint (TMJ) is a main part of this system. Muscles of mastication are responsible for the movement of TMJ [2]. Temporomandibular disorders (TMDs) is term that includes various conditions involves the TMJ, masticatory muscles, and their associated structures, such as ligaments, and connective tissues [3]. Myofascial pain disorder syndrome (MPD) is a common pain disorder of muscle. It represents some clinical problems, such as pain, limitation of the jaw movement, and TMJ noise [4].

Myofascial pain is the main symptom in the TMDs which is referred from a trigger point in the myofascial structures or from a distant area away. Myofascial trigger point is a hyperirritable point or spot usually with in a taut band of the muscle which is making a pain when it is compressed, also can make a characteristic referred pain and jaw dysfunction [5]. Pain is the main symptoms in MPD, its nature is varying in degree from mild to severe, it is a dull aching pain which may be localized or has a discrete referral pattern. It may be unilateral or bilateral usually present in front of ear and referred to head. MPD may exist as separate entity or comorbid with other entities such as, ear pain, neck pain and shoulder pain[6,7].

The prevalence of TMD is unclear. Some studies demonstrated that the prevalence of TMD is 34.9%, and MPD is the most common in prevalence which is10.3% also it has a higher prevalence in females, with peak age around 20-45 years [8,9]. The etiology of MPD is unclearly known which is multifactorial related to Para functional habits such as bruxism and tooth clenching. The psychological aspects, micro and macro trauma are considered as a predisposing, factors of MPD [10]. So the treatment approaches to MPD are complex due to the multifactorial pathogenesis [11].

Various treatment approaches have been described for the treatment of MPD. Conservative treatment of MPD is considered to be the most effective treatment option. It includes patient education, behavioural therapy or psychotherapy, pharmacotherapy, and inter occlusal splint therapy .Also many physical therapies such as thermal therapy, acupuncture, electrical Stimulation, ultrasound therapy, physiotherapy and LLLT [12]. So, the aim of this study were to valuate and compare between the short term clinical effect of three conservative treatment methods LLLT ,occlusal splints and pharmacotherapy on MPD.

## SUBJECTS AND METHODS

The Research Ethics Committee (REC). The present study was a prospective and comparative study which included 30 patients who were selected from a population of patients who attended the Department of Oral and Maxillofacial Surgery, Faculty of Dental Medicine for Girls, Al-Azhar University and Al-Zahraa University Hospital for MPD treatment.

### The study groups:

The patients were divided equally and randomly into three groups. Group I: patients were treated by low level laser therapy, Group II: patients were treated by oral appliance therapy stabilization splint (SS) and Group III: patients were treated by pharmacotherapy. The diagnosis procedure was based on the Research Diagnostic Criteria of TMDs (RDC/TMDs).Two variables were recorded: the first was muscles pain by using VAS( 0–10), the second was the maximum interincisal opening (MIO), which is a distance between the incisal edge of the upper and lower incisors. The follow up was at the first month weekly, then at 3, and 6 months. All patients underwent the Physiotherapy program which includes: A) Rest B) Thermotherapy C) Exercise therapy

### Inclusion criteria:

All patients were females suffering from MPD aged between 17 and 45years.

**Exclusion Criteria:**

Women who have trauma or head and neck surgery and tumor, women with previous diagnosis of neurological disorders, fibromyalgia and other painful musculoskeletal syndromes, women who used prescription drugs, such as anxiolytics anti -depressants, and anti convulsants, pregnancy and pace maker users were excluded.

***- Group I:***

Patients were treated by LLLT, benefited from a series of six sessions LLLT twice every week for three consecutive weeks, with the Epic x laser device (Epic x laser Device: Biolase, USA), (Gallium arsenide phosphide (GaAsP) semi-conductor diode; 940 nm wavelength; 10 W peak power).Treatment takes 5 minutes to provide relief from pain for each side (left and right). Laser parameters were selected for pain therapy program. LLLT was performed by placing the handpiece with protective cover on the affected area (temporalis muscle (anterior, middle, posterior band), zygomatic arch (origin of Masseter muscle), in the middle of the body of masseter muscle, from out ward at the angle of the mandible as the insertion of masseter muscle), posterior belly of digastric) by using the red laser beam as reference for center of the treatment location to position the handpiece, and by checking periodically the patients comfort during the use of the Epic x laser device. The eyes of patient and clinician were protected with colored green plastic glasses, and the laser fascicle irradiated the skin surface (fig. 1). The laser screen was seated to the recommended initial power settings for therapeutic effect (at 4.0 W delivered 10 minutes = 600 seconds of continuous treatment. The patient response was monitored in order to adjust the needed power and/or distance for the patient comfort. Power frequency was 50-60 Hz (Hertz) magnetic field and 3 A/m (Ampere per meter) in continuous level with energy density =1200J/cm$^2$ (Jules/cm$^2$)

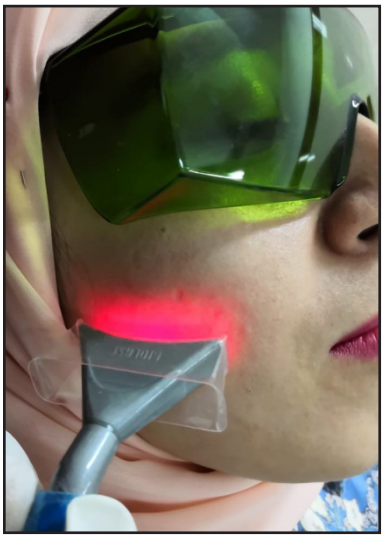

Figure (1) : A photograph showing the patient received LLLT

***- Group II:***

Patients were treated by oral appliance therapy, they were undergone stabilization splint .SS was fabricated and any additional modification or adjustments would be performed if necessary as described by Okeson [2], and patients were instructed to wear the SS 12 h/day for 3 weeks.

***- Group III:***

Patients received pharmacotherapy, as they were treated for three weeks with topical nonsteroidal anti-inflammatory gel (by massaging 4 times a day with Diclofenac diethylammanium 1.16% gel (voltaren emulgel 1.16% ., Novartis Consumer Health, Egypt), over the affected muscles area) and with oral NSAIDs (Ibuprofen (brufen 400mg tablets.Kahira pharmaceutical &chemical Ind Co. For Abbott and USA Laboratories and its branches), 400mg tablets three times a day for 3weeks).

**Statistical analysis:**

Data were statistically described in terms of mean ± standard deviation (± SD), median and range, or frequencies (number of cases) and percentages when appropriate. Comparison of numerical

variables between the study groups was done using Kruskal Wallis test with posthoc multiple 2-group comparisons. Two sided *p* values less than 0.05 was considered statistically significant. All statistical calculations were done using computer program IBM SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, NY, USA) release 22 for Microsoft Windows.

## RESULTS

### *- In Group I:*

The result of this study revealed that the mean value of preoperative pain which was 9.30(0.823) decreased gradually throughout the follow up duration where it was 2.90(2.025) at six months. Friedman test revealed that this decrease in the pain value was statistically significant (*P* value =0.0001).The findings of this study showed that the mean values of MIO in Group I increased from 28.25(3.967) (the mean value of preoperative MIO) to 37.30(5.034). This increase in MIO value was statistically significant (P value =0.0001).

### *- In Group II:*

At the six months postoperatively, the results of the present study clarified that the mean of the pain values decreased from 8.80(1.229) (the mean value of preoperative pain) gradually to 4.60(1.838). This decrease in the pain value was statistically significant (P value =0.0001).The results of this study revealed that the mean values of the MIO had been increased gradually throughout the follow up duration .At the six month postoperatively, the results of the present study clarified that the mean values of the group II increased from 27.40(5.816) (the mean value of preoperative pain MIO) gradually to 36.7(2.908). This increase in the mean of MIO values was statistically significant (*P* value =0.0001)

### *- In Group III:*

At the six month postoperatively, the results of this study showed that the mean of the pain values of the Group III decreased from 8.00(1.414) (the mean value of preoperative pain) to (4.50(2.415). This decrease in the pain value was extremely statistically significant (P value =0.0001). The results of this study showed that the mean values of the Group III increased from 26.75(4.443) (the mean value of preoperative pain MIO) gradually to 36.40(3.978). This increase in the mean of MIO values was extremely statistically significant (P value =0.0001).

The results showed that all patients of the three groups showed an improvement of MIO and pain score at the end of the follow up durations. There was a difference between group I and the other two groups as there was decrease of VAS score from baseline by mean 9.30(0.823) to 6 months by mean 2.90(2.025), also there was increase of MIO from baseline by mean 28.25(3.967) to 6 months by mean 37.30(5.034) of the LLLT group. Although a difference between groups I, II and III was observed throughout the follow up duration Postoperatively it did not reach a significant level as Kruskal–Wallis test revealed that the difference between the three groups was not statistically significant (*P* value =0.073, 0.616 respectively for pain score and MIO) (Table 1)

**Table (1):** *Comparison of pain score and MIO between the three groups throughout the follow up durations; mean standard deviation (SD).*

| Time | Outcome variables | Group I LLLT | Group II Inter occlusal splint therapy | Group III : pharmacotherapy | P –Value |
|---|---|---|---|---|---|
| **Preoperative** | **Pain score** | 9.30( 0.823) | 8.80(1.229) | 8.00(1.414) | 0.093 ns |
| | **MIO** | 28.25( 3.967) | 27.40(5.816) | 26.75(4.443) | 0.780 ns |
| **1st week** | **Pain score** | 7.60 (1.350) | 7.80(1.398) | 7.20(1.751) | 0.671 ns |
| | **MIO** | 33.25( 5.340) | 31.40(4.274) | 29.40(2875) | 0.174 ns |
| **2nd week** | **Pain score** | 6.00(1.333) | 6.40(1.430) | 6.10(1.449) | 0.805 ns |
| | **MIO** | 34.10(6.350) | 34.00(4.028) | 33.05(3.004) | 0.628 ns |
| **3rd week** | **Pain score** | 5.20(1.229) | 5.70(1.567) | 5.40(1647) | 0.743 ns |
| | **MIO** | 35.60(5.125) | 35.90(4.228) | 35.10(4.067) | 0.776 ns |
| **4th week** | **Pain score** | 4.70(1.636) | 5.20(1.135) | 5.00(1.886) | 0.589 ns |
| | **MIO** | 35.60(4.881) | 38.20(4.158) | 36.05(4.425) | 0.795 ns |
| **3 months** | **Pain score** | 4.00(1.764) | 4.70(1.494) | 5.00(2.211) | 0.452 ns |
| | **MIO** | 37.8(5.329) | 37.00(3.399) | 36.60(4.412) | 0.741 ns |
| **6 months** | **Pain score** | 2.90(2.025) | 4.60(1.838) | 4.50(2.415) | 0.073 ns |
| | **MIO** | 37.30(5.034) | 36.7(2.908) | 36.40(3.978) | 0.616 ns |

*Significance level p<0.05, ns= non-significant*

## DISCUSSION

Myofascial pain has an impact on the patient's daily activity and also decrease the quality of his life. Conservative treatment methods are usually preferred as the first-line treatment modality [12]. Recently LLLT has been introduced as a non-invasive physical treatment modality for the treatment of MPD [13]. Hence this study was performed to compare this modality with the conventional modality (splint and pharmacotherapy). In the present study, only women with age ranged from 17 to 45 years (with a mean age of 29.33 (8.121) years) were selected .The occurrence of MPD in females during this age as females are more prone to psychological disorders and they have low tolerance to pain in addition to the presence of female sex hormone estrogen, although MPD can be seen in both genders male and female and this is in agreement with previous studies [14,15]. The results of the present study clarified that there is improvement in the group I as the mean of the VAS score at base line has been changed from 9.30(0.823) to 2.90(2.025) at 6 months, also there is improvement in the mean of MIO from 28.2(3.967) at baseline to 37.30(5.034) at 6 months with a statistical significant value. This denotes that the use of LLLT has effective role to improve the pain and increased mouth opening. This could be due to the Epic x diode laser device in pain therapy make local heating of the treated tissues, which would induce a temporary increase of the blood circulation, and temporary relaxation of the contracted muscles. This was seem to be more effective in the reduction of pain and safe to use as LLLT has biostimulative, analgesic, anti-inflammatory and regenerative effects. LLLT reported no adverse effects, lack of systemic side effects, good acceptance by patients and this is in accordance with several studies [16-18] which showed a positive clinical effects of LLLT on pain relief, and change of VAS score also there was improvement of MIO between the baseline and the final follow-up time point.

The results showed a statically significant improvement in group II in comparison to the pre-operative clinical outcomes regarding VAS score which had been changed from 8.80(1.229) at baseline to 4.60(1.838) at 6 months and regarding MIO which had been improved from 27.40(5.816) at baseline to 36.7(2.908) at 6 months, this finding corroborates the results of previous studies [13,19] which showed improvements in outcomes variables after wearing splint [13,19,20]. As the SS may help the patients in recognizing their habits so reducing clenching and tooth-grinding behaviours also splint eliminates mechanical stress, and distributes the occlusal forces so reducing the effects of clenching or grinding the teeth by reducing the muscular tension and protecting teeth, against wear. Stabilization splint SS providing centric occlusion and in turn this position decrease contraction of muscles and improve the interincisal opening. Meanwhile other studies revealed that SS treatment does not offer a significant improvement on MPD [21,22].

In group III, the study's results showed a significant improvement in the pre-operative clinical outcomes regarding VAS score which had been changed from baseline 8.00(1.414) to 6 months 4.50(2.415) and regarding MIO which had been improved from baseline 26.75(4.443) to 6 months 36.40(3.978), this finding corroborates the results of previous studies [23-25].As the main role of NSAIDs is to provide analgesia sufficient to break pain cycle, reducing the pain, muscle spasm and to restore the normal function. In contrast with other studies [26,27] which showed negative outcome for ibuprofen was obtained as it provided no statistically significant reduction in pain.

The results showed that all patients of the three groups showed an improvement of MIO and VAS score at the end of the follow up durations. There was a difference between the three groups but was not statistically significant and this is in accordance with other studies[13,19].This denotes that all treatments modalities were applied in this study effective to control pain and improve MIO for the patients with MPD but the difference between them was not statistically significant.

## CONCLUSION

Within the limitations the findings of this study clarified that LLLT can be considered as a suitable and non-invasive treatment alternative for MPD .Also it was effective, had showing promising results and can be used as treatment of MP. LLLT can be considered as a treatment of choice which in short term duration which has biostimulative, analgesic, anti-inflammatory, regenerative effects .LLLT reported no adverse effects, with good acceptance by patients, and it can be easily applied in myogenous diseases.

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