



EFFECT OF LOW-LEVEL LASER APPLICATION IN CONJUNCTION WITH SPLINT THERAPY FOR MANAGEMENT OF TEMPOROMANDIBULAR JOINT DISORDERS

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ABSTRACT

Objective: This Randomized clinical trial was conducted to assess the value of using LLLT (Low level Laser Therapy) plus Splint therapy in comparison with using splint therapy alone for treatment of TMDs. **Subject & Methods:** Twenty-six patients with TMDs were divided into 2 equal groups: Group I was the trial group where 5 LLLT sessions were done for all patients on a period of 5 weeks in conjunction with splint therapy, group II as a control group (splint therapy only). Pain level, maximum mouth opening, lateral excursions, clicking sounds and disc position were recorded and analyzed statistically. **Results:** There was a non-statistically significant difference after 6 months concerning pain level, maximum mouth opening, lateral excursions and disc position. However there was improvement regarding pain level initially for the trial group. **Conclusion:** LLLT proved to be helpful with encouraging effect in alleviating pain during of treatment acute phase of TMDs, however, it has no significant effect on range of motion or disc position.

KEYWORDS: Low Level Laser Therapy, Splint, TMD

INTRODUCTION

Temporomandibular disorder (TMD) is a set of clinical conditions that includes disorders of the TMJ and/or the masticatory muscles. Most common symptoms are pain, joint noises, and restricted mandibular movement. A variety of other symptoms may occur, such as tinnitus, abnormal swallowing, and hyoid bone tenderness. These symptoms compromise quality of life, sleep, and the psychological well-being, leading to anxiety, stress, depression, and a negative effect on social function, emotional health, and energy level⁽¹⁾.

The incidence of signs and symptoms of TMD varies from 21.5% to 50.5%, and they occur more

frequently among women than men. The etiopathogenesis of TMD remains unclear. In general, it is thought that the origin of TMD is multifactorial, including biomechanical, neuromuscular, biopsychosocial, and biological factors⁽²⁾. Therefore, the mainstay of treatment for TMD is a multidisciplinary approach that includes physical therapy modalities such as manual therapy⁽³⁾, electrotherapy, ultrasound⁽⁴⁾, transcutaneous electrical nerve stimulation (TENS)⁽⁵⁾, or laser therapy⁽⁶⁾. Among the various physical therapy modalities, low level laser therapy (LLLT) has recently been put under the spotlight because of its easy application, short treatment time, and few contraindications.

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Many prospective clinical trials have been performed to evaluate the efficacy of LLLT. However, the results have been controversial⁽⁶⁻¹¹⁾. Some authors have reported the superiority of LLLT over other physiotherapy modalities and placebo^(6,9,11), while others have found no significant differences between LLLT and other physiotherapy modalities or placebo^(7,10).

Recently published meta-analysis researches concluded that applying LLLT to the masticatory muscle or joint capsule has a moderate analgesic effect on TMJ pain⁽¹²⁾. However, these researches also provided an evidence that using LLLT could significantly improve the functional outcomes of patients with TMD⁽¹³⁾. In addition, many new randomized controlled trials (RCTs) have been conducted, which may accumulate evidence on the use of LLLT for TMD⁽¹³⁻¹⁸⁾. This study was conducted to evaluate the role of LLLT in the management of TMD in conjunction with splint therapy to provide a solid evidence for support or refute of its efficacy.

The aim of the study was to evaluate the effect of low-level laser application in conjunction with splint therapy for the treatment of temporomandibular joint disorders.

MATERIALS AND METHODS

Patients of the present study were selected from those attending the Outpatient Clinics of Oral and Maxillofacial Surgery Department at Sayed Galal Hospital, AL Azhar University. Patients were 26 (Female 20, male 6) with average age of 18 y. They were suffering from bilateral anterior disc displacement with reduction and seeking treatment. The clinical diagnosis was verified by MRI for each patient. The patients were free from any systemic diseases and did not have any pain from other sources e.g. carious teeth, impactions, infections, or pathologic lesions. All patients were informed about the details of the procedures and signed a written consent.

Patients were divided randomly into two groups for a total number of twenty-six patients (13 patients for each group) according to method of treatment as follows:

- Group I: (13 Patients). Soft tissue diode laser, as a source of Low-level laser therapy (LLLT), with energy density of 8 j/cm², WL 980 nm, continuous mode of emission, power equipment 30mw in conjunction with splint therapy.
- Group II: (13 patients). Control Group, splint therapy only.

The source of Laser used in this study is “Doctor Smile, Simpler version (Doctor smile is a line of products made by LAMBDA -spA -Vicenza-Italy-www.lambdaspa.com)

Operative steps:

1. A stabilizing splint was also done for each patient as an adjunctive treatment. By adapting a thermoplastic sheet over the cast (using a vacuum machine), then raising the bite of the patient by 5mm using cold cure acrylic resin, followed by removal of occlusal interferences
2. Muscle examination was performed for all muscles of mastication, sternocleido-mastoid, and trapezius muscles. Trigger points on these muscles were examined and identified using a chart¹⁹. Range of movements (Mouth Opening and Lateral excursions), clicking sounds assessment (using stethoscope) were also recorded.
3. Pain level was evaluated for each trigger point using VAS (visual analogue scale).
4. Five sessions of LLLT within 5 weeks (once a week) was done over TMJ and muscle trigger points.
5. After each session, VAS reading, range of movement, clicking sounds assessment were recorded. Also, Patients were instructed for soft diet, and avoidance of para functional habits.

6. After finishing of LLLT sessions over 5 weeks, follow up sessions (once every two weeks for four and a half months) for splint adjustment according to progression or regression of VAS pain reading.
7. MRI was done for the patient to assess the disc position, both open and closed.at 5 weeks (Fig. 1).

Statistical analysis:

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp). Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the

normality of distribution. Quantitative data were described using range (minimum and maximum), mean, standard deviation and median. Significance of the obtained results was judged at the 5% level.

RESULTS

Concerning pain level, the statistical analysis showed gradual improvement in both groups compared with baseline scores. However, when comparing pain improvement between two groups, there was a statistical difference in the short term (first 3 weeks) where group I was better in alleviating pain. However, at the end of six months, there was no statistical differences between the two groups (Tables 1-4).

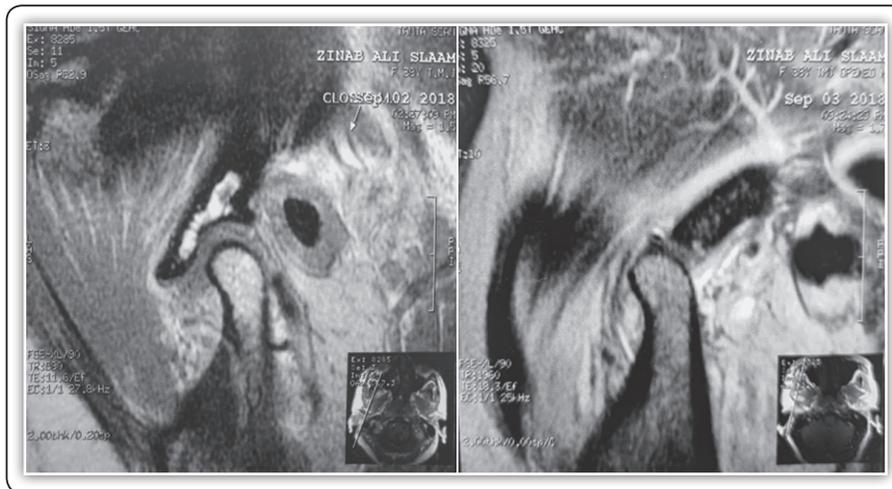


FIG (1) (left) Preoperative MRI closed Position, (Right): Preoperative MRI Open position

TABLE (1) Pain level comparison between the two groups

	Pain level										Fr	p
	Week 1		Week 2		Week 3		Week 4		Week 5			
	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD		
Group I	7.29	0.76	4.29	0.95	3.86	0.90	2.71	1.11	0.29	0.49	26.696*	<0.001*
P_{Baseline}			0.176		0.009*		0.002*		<0.001*			
Group II	7.71	0.49	6.86	0.90	5.86	0.90	3.71	1.11	0.71	0.76	27.710*	<0.001*
P_{Baseline}			0.398		0.028*		0.001*		<0.001*			

Concerning maximum mouth opening (Table 2 & 3) and lateral excursion movements, both groups showed no statistical difference between base line measurements and after 5 weeks. Also, both groups nearly showed equal results at the end of the follow up.

TABLE (2) Descriptive statistics of maximum mouth opening in each studied group

Groups	Time	Maximum mouth opening						
		Min.	Max.	Mean	±SD	Median	95% CI	
							LL	UL
Group I	At baseline	36.0	40.0	38.57	1.40	39.0	37.28	39.86
	Week 5	36.0	40.0	38.71	1.38	39.0	37.44	39.99
Group II	At baseline	36.0	39.0	38.0	1.0	38.0	37.08	38.92
	Week 5	36.0	40.0	38.86	1.46	39.0	37.50	40.21

TABLE (3) Descriptive statistics of excursive movements in each studied group

Groups	Time	Excursive movements						
		Min.	Max.	Mean	±SD	Median	95% CI	
							LL	UL
Group I	At baseline	5.0	7.0	5.71	0.76	6.0	5.02	6.41
	Week 5	5.0	7.0	6.0	0.58	6.0	5.47	6.53
Group II	At baseline	5.0	7.0	5.67	0.75	6.0	5.02	6.41
	Week 5	5.0	7.0	5.98	0.82	6.0	5.24	6.76

The recorded data for measurement and evaluation of TMJ clicking sounds indicated that both groups had no statistical difference compared with pre-operative, (Table 4).

TABLE (4) Comparison between the two groups according percentage of Improvement of TMJ clicking

	Week 5 Percentage of Improvement of Clicking of TMJ		McNp
	No.	%	
Group I	10	76.4	0.500
Group II	11	84.7	1.000

The changes in disc position were analyzed statistically with no significant difference in both groups compared with the base line, (Table 5)

TABLE (5) Comparison between the different time periods in each group according to disc position

	Disc position at week 5	
Group I		
Improved	0	0
No change	13	100
Group II		
Improved	0	0
No change	13	100

DISCUSSION

The use of LLLT has been seen as a complementary option for the treatment of TMD^(6,9,11,13) due to its analgesic, anti-inflammatory, and regenerative effects with no reported adverse effects and good acceptance by patients^(6,14,18,20-25). In view of the lack of robust evidence about the effects of LLLT on TMD, recent systematic reviews did not reach a consensus^(12,26,27).

Based on our results, the analgesic effect of LLLT in the first weeks of treatment are consistent with findings of Chang et al.,⁽¹²⁾ and in contrast to those of Chen et al.⁽¹³⁾. On the other hand, the results regarding functional outcomes (motion) were in accordance with those of Chen et al⁽¹³⁾.

As pain is the principal complaint of patients with TMD, pain is the most common reason why patients with TMD seek medical help. Pain occurs at any stage of TMD and pain reduction contributes to ameliorating jaw motion^(13,28), chewing⁽²⁹⁾, and masticatory performance⁽¹⁵⁾.

Regarding the relationship between laser effectiveness and follow-up period, Law et al⁽³⁰⁾ found that long-term follow-up effects increased in three types of musculoskeletal disorders (myofascial pain/musculoskeletal trigger points, lateral epicondylitis, and temporomandibular joint pain). Pooled effect sizes were doubled during the follow-up period compared to those at the end of Laser intervention, suggesting that laser may have delayed or long-lasting effects. However, our follow-up subgroup analysis showed a more consistent result, contrary to Law et al., both of pain evaluation methods showing significant differences only in short-term follow up between the laser and control groups. LLLT targeted the chief complaint of the patient, which is pain, and by controlling pain specially in a short-term period, all other symptoms started to improve e.g., range of movements, clicking sounds, and disc position at the end of follow up period of 6 months, but that was attributed mainly

because of the splint therapy, not LLLT as LLLT proved to have no significance regarding range of motion, clicking sounds & disc position.

CONCLUSION

LLLT is a good adjunctive treatment modality for pain management during acute phase of TMDs, but, it has no significant effect on range of motion or disc position.

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