Laser therapy versus occlusal splint and local anesthesia injection in management of myofascial pain dysfunction syndrome.

Tamer Ahmed Nasr [1] , Ayman Gouda [2] , Eman Gamal [3], Amany Moussa [4] , Abla Eledissi [5]

Original Article

[1] Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Misr International University, Cairo, Egypt. [2] Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Cairo University, Cairo, Egypt. Associate professor, Fixed and removable Prosthodontics Department, National research center, Cairo, Egypt. , master of periodontology, Cairo University, Fellowship of LASER in dentistry/ Genova University. Specialty doctor of Oral and Maxillofacial Surgery, Leicester Royal Infirmary, England

ABSTRACT

Background: Myofascial pain disorders, affecting chewing muscles, require a multidisciplinary approach to reduce pain and impairment, requiring a combination of various methods and disciplines. The therapy objectives encompass reducing both pain and impairment.

Aim: to compare and evaluate the effectiveness of using a flat occlusal splint, injecting local anesthesia, and laser application in the trigger points of the masseter muscle in managing myofascial pain dysfunction syndrome (MMDS)

Materials and methods: Ninety patients aged 2163- years old were selected and randomly assigned to three groups of 30 patients each. The guidelines of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) were adopted for diagnosis. Group 1 patients were treated with splint therapy, group 2 with local anesthesia injection, and group 3 with laser application. Patients were instructed to decrease muscle loading and prescribed oral pain killers.

Results: showed significant statistical differences in all three groups, indicating a positive improvement in overall signs and symptoms. By the end of the 1-year follow-up period, there was no statistically significant difference between the splint and injection groups, but both showed significantly higher pain scores at rest and on opening than the laser group. Pair-wise comparisons revealed no statistically significant difference between the injection and laser groups, but both showed significantly lower MMO than the splint group.

Conclusion: The results of this study indicate that the three methods proved to be effective in reducing the pain and improving the mouth opening in MPDS patients.

Key Words: Myofascial temporomandibular disorder; trigger point injection, stabilizing splint, LLL photo-biomodulation

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Corresponding Author: tamer ahmed , Associate professor, Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Misr International University, Cairo, Egypt. , **Mobile:** 01111979442 , **E-mail:** tamer.nasr@miuegypt.edu.eg

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INTRODUCTION:

The temporomandibular joint (TMJ) and its related neuromuscular nervous system. A deviation in the normal functioning of one or both of these structures might result in a temporomandibular disorder (TMD). The onset of a disorder occurs when any problem disrupts the harmonious functioning of this system comprising muscles, bones, and joints. Unilateral or bilateral symptoms can impact the jaw, head, or face. [37]

Temporomandibular disorders often present with symptoms such as restricted mouth opening, clicking, discomfort, and tension in the jaw muscles and the area in front of the ear. Temporomandibular issues are more prevalent in women compared to men, and they primarily affect those aged 20 to 40. [57,58]

Myofascial pain is the predominant temporomandibular pathology. Other synonyms for the term are craniomandibular dysfunction, temporomandibular joint dysfunction syndrome, and myofascial pain dysfunction syndrome (MPDS),

which is defined by the existence of trigger points that impact different muscle groups, leading to pain induced by muscular contractions and sensitivity when these trigger sites are touched against the skin. [10,31,36]

Myofascial trigger points are palpable, tense bands of skeletal muscle fibers that, when compressed, can elicit both local and referred pain. Based on published data, the prevalence of these occurrences varies from 30% to 93% in individuals who experience pain in any part of their body. Local anesthetic injections or dry needling are

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the most effective methods for relieving this pain. [48,75]

The genesis of myofascial pain syndrome is currently being investigated. Myofascial pain syndrome can be triggered by various factors, such as stress, bruxism, occupational factors, genetic factors, fatigue, and specifically, chronic injuries caused by repetitive micro traumas. [51,67]

The primary objective of treating myofascial temporomandibular discomfort is to alleviate pain and/or correct mandibular dysfunction. Treatment options encompass surgical interventions and are categorized as either irreversible or conservative. Physical therapy, stretching, massage, stress-reduction techniques, acupuncture, pharmacology, electrotherapy, ultrasound, dry needling, low-level laser therapy, and botulinum toxin injection are some instances of reversible interventions. [3,39] Additionally, there have been accounts of effective treatment with occlusal splints. Various types of occlusal splints have been used to treat MPDS. The occlusal splint used in our experiment is a flat type of splint. The hard acrylic splint serves as a stabilizing device that promotes neuromuscular balance by reducing abnormal muscle activity. [21,53] Greene, Laskin, and Dahlstro emphasized the necessity of employing conservative approaches in the treatment of TMD. Occlusal splints, known for their reversibility, have been proven to reduce pain and hyperactivity in the muscles linked to temporomandibular disorders (TMD). [19,32,43]

The American Academy of Orofacial Pain recommendations state that the goals of stabilization appliances are to achieve joint stabilization, preserve the teeth, redistribute occlusal forces, relax the elevator muscles, and reduce bruxism. Moreover, it is stated that wearing the device assists in modifying the resting posture of the mandible to a state of greater relaxation and openness, while also enhancing the patient's consciousness of their jaw habits. [43] Trigger point injection has proven to be effective in treating MPS. Trigger point injections can serve as a supplementary treatment or as the sole method of care. [39,45]

Trigger point injection with a local anesthetic solution is a highly effective therapeutic technique that is frequently recommended for achieving optimal results. [30,35]Low level laser treatment (LLLT) is a conservative approach that can effectively alleviate discomfort associated with MPDS. LLLT, or Low-Level Laser Therapy, has experienced a surge in popularity as a therapy modality, particularly for localized painful muscle problems. Low-level laser therapy (LLLT) possesses anti-inflammatory, analgesic, and regenerative properties, making it a suitable treatment for myogenous disorders. [4,8,47] In addition, Low-Level Laser Therapy (LLLT) enhances the flow of lymphatic fluid, hence decreasing swelling (edema). This therapeutic method has demonstrated rapid efficacy. [73]

Laser photobiomodulation (PBM), also known as low level laser therapy (LLLT), is a painless and non-invasive therapeutic method used in modern physiotherapy. It can have both local and systemic effects on patients.[15]

The impact of PBM on tissues is contingent upon various parameters, including wavelength, irradiation mode (continuous or pulse), energy fluence, power output, pulse duration, pulse time interval, and irradiance. [1,6,40-42] PBM activates cells, including pain receptors in peripheral tissues and the immune system, leading to vasodilation and analgesic effects. This is why it is commonly employed to alleviate patients' pain. In addition, laser therapy has the ability to induce repairs in injured tissues and peripheral nerves, resulting in neurological regeneration. [5,18,27]

The aim of this study was to assess and compare the efficacy of three different treatment methods - the flat occlusal splint, trigger point injection with local anesthetic, and laser application - in the management of myofascial temporomandibular discomfort.

Materials and methods:

The study design was ethically approved by research ethics committee, faculty of dentistry, Cairo University number 47/7/23.
Patients in this study were selected from the outpatient clinic of Oral and Maxillofacial Surgery Department of Cairo university and the outpatient clinic of Oral and Maxillofacial Surgery Department, Airforce specialized hospital, Cairo, Egypt. Ninety patients aged 21-63 diagnosed with myofascial temporomandibular disorder (TMD) were selected for the study and randomly assigned to three groups of 30 patients each. Group 1 patients were treated using splints, Group 2 by injection of local anesthesia, and Group 3 by Laser application.

Patients were examined clinically, and the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) were used for the diagnosis of myofascial temporomandibular disorder TMD. Inclusion criteria included pain of muscular origin limited to the masseter muscles with or without limited mouth opening, duration of pain at least 3 months associated with localized areas of tenderness to palpation in the muscles with self-assessed facial pain of at least 6 on a numerical rating scale-NRS. Patients with TMJ pain, or those who had any previous treatment for TMD were excluded. Patients with any history of cervical or degenerative conditions, any surgery or trauma to the neck during last year, previous treatment of MPDS during last year, confirmed diagnosis of fibromyalgia or rheumatoid arthritis were also excluded.

Patients of all groups were given instructions to decrease muscle loading. No other treatments were used, and the patients were asked to stop other pain medications and therapies.

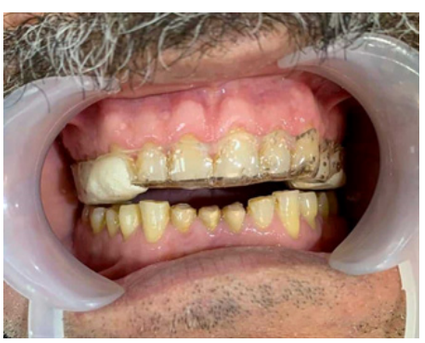
A panoramic radiographic evaluation was performed for all patients to exclude any dental cause of facial pain. After history taking,

clinical examination included palpating the joints, checking the presence or absence of joint clicking, joint sounds, or pain at the TMJs during mandibular movements to exclude any TMJ problem. Palpating the muscles of mastication was then carried out and patients with unilateral or bilateral masseter muscle tenderness were included in the study.

Two outcomes were evaluated in this study: pain in trigger points and the maximal incisal opening. Pain at rest and on opening the jaw and MMO (maximum mouth opening) were evaluated preoperatively, two days postoperatively, then at 3 months, 6 months, and 1 year.

All patients were requested to provide their own subjective assessment of pain utilizing the NRS scale, patients rated the pain of 0-10 with zero being no pain and ten having severe pain, the values were recorded on the patient's chart. Tenderness of the muscles of mastication was assessed by means of digital palpation at rest and on opening. Assessment of the MMO was done by measuring the distance in mm between the incisal edges of the upper and lower central incisors using metallic caliper gauge (millimeter scale).

In group 1, upper impressions were taken and the fabrication of a flat occlusal (stabilization) splint was done using hard acrylic resin. Patients were asked to insert the occlusal splint every night before going to sleep for the whole period of follow-up and patients with habitual bruxism were asked to continue wearing the splints. (Fig 1)



Figuer 1. Flat occlusal splint in position.

In group 2, the trigger point was identified within the masseter muscle. Antiseptic preparation of the skin was performed, the muscle was stabilized between the thumb and forefinger and the needle was introduced into the TrP. The trigger points were injected with 0.5 ml of plain Lidocaine 2 % local anesthetic solution. In this group, each trigger point received two sessions a week for 4 weeks, then once a week for 3 months, then twice a month for 4 months.

They received no injections in the last 4 months. The injections were administered with a conventional dental syringe using a 27-gauge needle. (Fig 2)

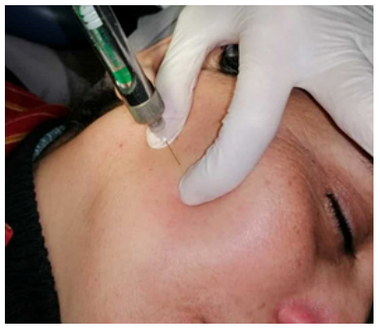


Figure 2. Injection of plain local anesthetic into masseter muscle.

In group 3, LLLT was performed with a Body Contour Hand pieceepic-x940 nm DIODE LASER system, that has an energy density of 1.8 to 4kJ, CW Mode with 8 irradiation sessions applied in one month, two applications weekly, the application time was 5-10 minutes for the affected muscles, and the distance to tissue was around 1cm and up to 3cm for darker skin types. (Fig 3,4)

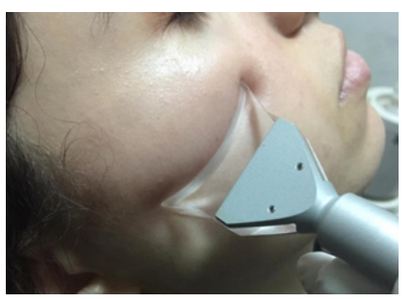


Figure 3. Biostimulation of masseter muscle by simpler handpiece

Figure 4. LLL (simpler 980 nm) DIODE LASER

All patients were recalled for follow-up 2 days post-operatively after the first treatment session, then at 3 months, 6 months, and 1 year for assessment of the pain and measuring the interincisal opening regardless of their group and the type and frequency of the treatment used.

Statistical Analysis

Numerical data were explored for normality by checking the distribution of data and using tests of normality (Kolmogorov-Smirnov and Shapiro-Wilk tests). Age and maximum mouth opening (MMO) data showed normal (parametric) distribution while pain (NRS) scores showed non-normal (non-parametric) distribution. Data were presented as mean, standard deviation (SD), median and range values. For parametric data; one-way ANOVA test was used to compare between mean age values in the three groups. Repeated measures ANOVA test was used to compare between MMO in the three groups as well as to study the changes within each group. Bonferroni's post-hoc test was used for pair-wise comparisons when ANOVA test is significant. For non-parametric data, Kruskal-Wallis test was used to compare between the three groups. Friedman's test was used to study the changes within each group. Dunn's test was used for pair-wise comparisons when Kruskal-Wallis or Friedman's test is significant. Gender data were presented as frequencies and percentages. Chi-square test was used to compare between gender distributions in the three groups. The significance level was set at $P \leq 0.05$. Statistical analysis was performed with IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.

RESULTS

1. Demographic data

There was no statistically significant difference between mean age values in the three groups. There was a statistically significant difference between gender distributions in the three groups. Laser group showed the highest prevalence of males followed by injection group while splint group showed the lowest prevalence of males.

Table 1: Mean, standard deviation (SD), frequencies (n), percentages and results of one-way ANOVA test and Chi-square test for comparison between demographic data in the three groups

	Splint (n = 30)	Injection (n = 30)	Injection (n = 30)	P-value
Age (Years)				0.140
Mean (SD)	42.3 (10.7)	41.1 (11.1)	36.9 (10.9)	
Gender [n (%)]				<0.001*
Male	2 (6.7)	5 (16.7)	17 (56.7)	
Female	28 (93.3)	25 (83.3)	13 (43.3)	

*: Significant at $P \leq 0.05$

2. Pain (NRS) score at rest

Pre-operatively; there was no statistically significant difference between pain at rest in the three groups (P-value = 0.662, Effect size = 0.009).

After two days, three, six months as well as one year; there was a statistically significant difference between pain at rest in the three groups (P-value <0.001, Effect size = 0.493), (P-value <0.001, Effect size = 0.773), (P-value <0.001, Effect size = 0.586) and (P-value <0.001, Effect size = 0.483), respectively. Pair-wise comparisons between the groups revealed that there was no statistically significant difference between splint and injection groups; both showed statistically significantly higher pain at rest scores than Laser group.

As regards changes by time in splint as well as injection groups, there was a statistically significant change in pain at rest scores by time (P-value <0.001, Effect size = 0.97) and (P-value <0.001, Effect size = 0.975), respectively. Pair-wise comparisons between time periods revealed that there was no statistically significant change in pain scores after two days followed by a statistically significant decrease after three months as well as from three to six months. From six months to one year, there was no statistically significant change in pain scores.

As regards changes by time in Laser group, there was a statistically significant change in pain at rest scores by time (P-value <0.001, Effect size = 0.986). Pair-wise comparisons between time periods revealed that there was a statistically significant decrease in pain scores after two days as well as from two days to three months followed by non-statistically significant change through the rest of follow-up times.

3.Pain (NRS) score on opening

Pre-operatively; there was no statistically significant difference between pain at movement in the three groups (P-value = 0.053, Effeact size = 0.082).

After two days, three, six months as well as one year; there was a statistically significant difference between pain at movement in the three groups (P-value <0.001, Effect size = 0.549), (P-value <0.001, Effect size = 0.786), (P-value <0.001, Effect size = 0.571) and (P-value <0.001, Effect size = 0.48), respectively. Pair-wise comparisons between the groups revealed that there was no statistically significant difference between splint and injection groups; both showed statistically significantly higher pain at movement scores than Laser group. As regards changes by time in splint as well as injection groups, there was a statistically significant change in pain at movement scores by time (P-value <0.001, Effect size = 0.981) and (P-value <0.001, Effect size = 0.969), respectively. Pair-wise comparisons between time periods revealed that there was no statistically significant change in pain scores after two days followed by a statistically significant decrease after three months as well as from three to six months. From six months to one year, there was no statistically significant change in pain scores.

4. Maximum mouth opening (MMO) in mm

Pre-operatively; there was a statistically significant difference between MMO in the three groups (P-value = 0.001, Effect size = 0.158). Pair-wise comparisons between the groups revealed that there was no statistically significant difference between splint and injection groups; both showed statistically significantly higher MMO than Laser group.

After two days, there was a statistically significant difference between MMO in the three groups (P-value <0.001, Effect size = 0.237). Pair-wise comparisons between the groups revealed that there was no statistically significant difference between splint and injection groups; both showed statistically significantly lower MMO than Laser group. After three months, there was no statistically significant difference between MMO in the three groups (P-value = 0.096, Effect size = 0.052).

After six months as well as one year; there was a statistically significant difference between MMO in the three groups (P-value = 0.012, Effect size = 0.096) and (P-value = 0.009, Effect size = 0.103), respectively. Pair-wise comparisons between the groups revealed that there was no statistically significant difference between injection and Laser groups; both showed statistically significantly lower MMO than splint group.

As regards changes by time in splint as well as injection groups, there was a statistically significant change in MMO scores by time (P-value <0.001, Effect size = 0.555) and (P-value <0.001, Effect size = 0.443), respectively. Pair-wise comparisons between time periods revealed that there was no statistically significant change in MMO after two days followed by a statistically significant increase after three months, from three to six months as well as from six months to one year.

As regards changes by time in Laser group, there was a statistically significant change in MMO scores by time (P-value <0.001, Effect size = 0.916). Pair-wise comparisons between time periods revealed that there was a statistically significant increase in MMO after two days followed by non-statistically significant change through the rest of follow-up times.

Table 2 : Descriptive statistics and results of Kruskal-Wallis test for comparison between pain (NRS) scores at rest in the three groups and Friedman's test for the changes within each group

Time	Splint (n = 30)		Injection (n = 30)		Laser (n = 30)		P-value	Effect size (Eta squared)
	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)		
Pre-operative	8 (6-10) C	8.2 (1.2)	8 (6-10) ^{C}	8.2 (0.9)	8 (6-9) ^{C}	8 (0.9)	0.662	0.009
2 days	8 (6-10) AC	8.2 (1.2)	9 (7-10) ^{AC}	8.9 (0.9)	6(4-8) ^{BD}	6.4 (1.1)	<0.001*	0.493
3 months	6 (2-9) AD	5.5 (1.6)	5 (2-8) ^{AD}	4.9 (1.5)	0 (0-1) ^{BE}	0.3 (0.5)	<0.001*	0.773
6 months	4 (1-7) AE	4 (1.6)	3.5 (0-7) ^{AE}	3.4 (1.8)	0 (0-1) ^{BE}	0.2 (0.4)	<0.001*	0.586
1 year	3 (1-7) AE	3.5 (1.7)	2.5 (0-7) ^{AE}	2.3 (1.7)	0 (0-1) ^{BE}	0.2 (0.4)	<0.001*	0.483
P-value	<0.001*		<0.001*		<0.001*			
Effect size (w)	0.97		0.975		0.986			

*: Significant at $P \leq 0.05$,
A,B superscripts in the same row indicate statistical significant difference between groups,
C,D,E superscripts in the same column indicate statistical significant change by time within each group

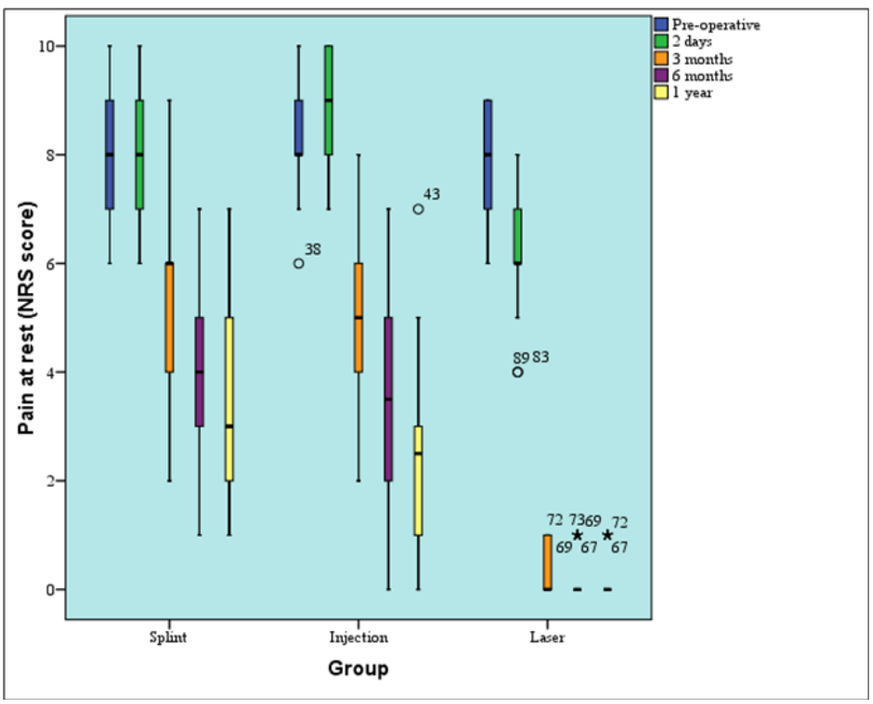


Figure 5: Box plot representing median and range values for pain (NRS) scores at rest in the three groups (Circles and stars represent outliers)

Table 3: Descriptive statistics and results of Kruskal-Wallis test for comparison between pain (NRS) scores at movement in the three groups and Friedman's test for the changes within each group

Time	Splint (n = 30)		Injection (n = 30)		Laser (n = 30)		P-value	Effect size (Eta squared)
	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)		
Pre-operative	9 (6-10) C	8.8 (1.1)	9 (6-10) C	8.7 (1)	8 (6-9) C	8.1 (0.9)	0.053	0.082
2 days	9 (6-10) AC	8.8 (1.1)	9 (7-10) AC	9.1 (0.9)	6.5 (4-8) BD	6.5 (1.1)	<0.001*	0.549
3 months	6 (3-9) AD	5.8 (1.6)	5 (2-8) AD	5 (1.5)	0 (0-1) BE	0.3 (0.4)	<0.001*	0.786
6 months	4 (1-7) AE	4 (1.6)	3.5 (0-7) AE	3.5 (2)	0 (0-1) BE	0.2 (0.4)	<0.001*	0.571
1 year	3 (1-7) AE	3.5 (1.7)	2.5 (0-7) AE	2.3 (1.8)	0 (0-1) BE	0.2 (0.4)	<0.001*	0.48
P-value	<0.001*		<0.001*		<0.001*			
Effect size (w)	0.981		0.969		0.986			

*: Significant at $P \leq 0.05$,
A,B superscripts in the same row indicate statistical significant difference between groups,
C,D,E superscripts in the same column indicate statistical significant change by time within each groups

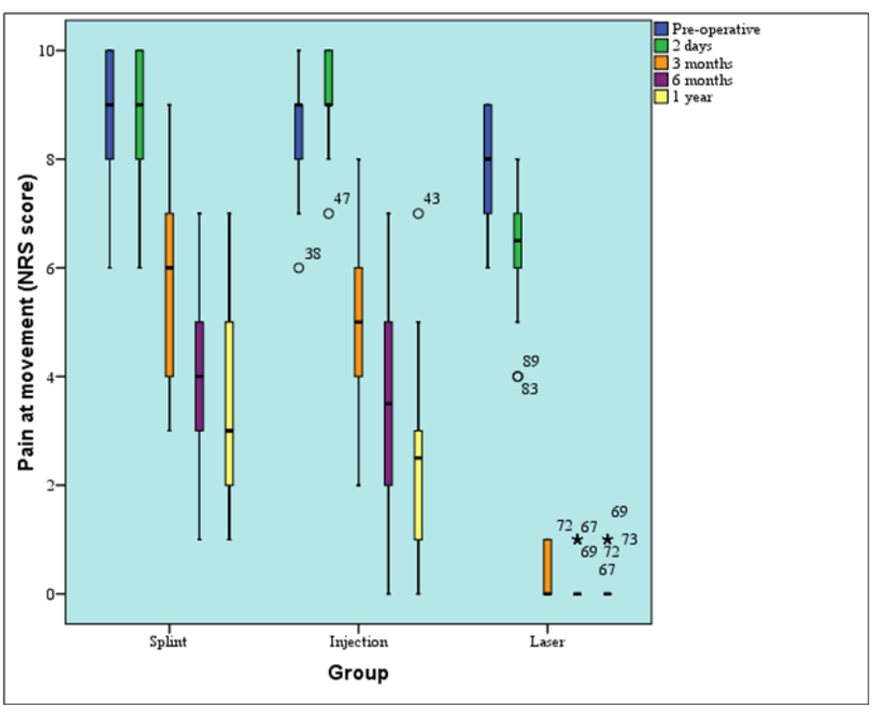


Figure 6: Box plot representing median and range values for pain (NRS) scores at movement in the three groups (Circles and stars represent outliers)

Table 4: Descriptive statistics and results of repeated measures ANOVA test for comparison between MMO (mm) in the three groups and the changes within each group

Time	Splint (n = 30)		Injection (n = 30)		Laser (n = 30)		P-value	Effect size (Eta squared)
	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)	Median (Range)	Mean (SD)		
Pre-operative	32.3 AF	10.04	30.2 AF	6.05	24.8 BD	5.32	0.001*	0.158
2 days	32.3 BF	10.04	30.2 BF	6.05	40.03 AC	6.42	<0.001*	0.237
3 months	40.3 E	9.77	37.1 E	4.58	40.83 C	5.99	0.096	0.052
6 months	44.37 AD	10.6	38.5 BD	4.58	41.03 BC	5.87	0.012*	0.096
1 year	45.97 AC	10.95	40.07 BC	4.93	41.17 BC	5.79	0.009*	0.103
P-value	<0.001*		<0.001*		<0.001*			
Effect size (Partial Eta squared	0.555		0.443		0.916			

*: Significant at $P \leq 0.05$,
A,B superscripts in the same row indicate statistical significant difference between groups,
C,D,E,F superscripts in the same column indicate statistical significant change by time within each groups

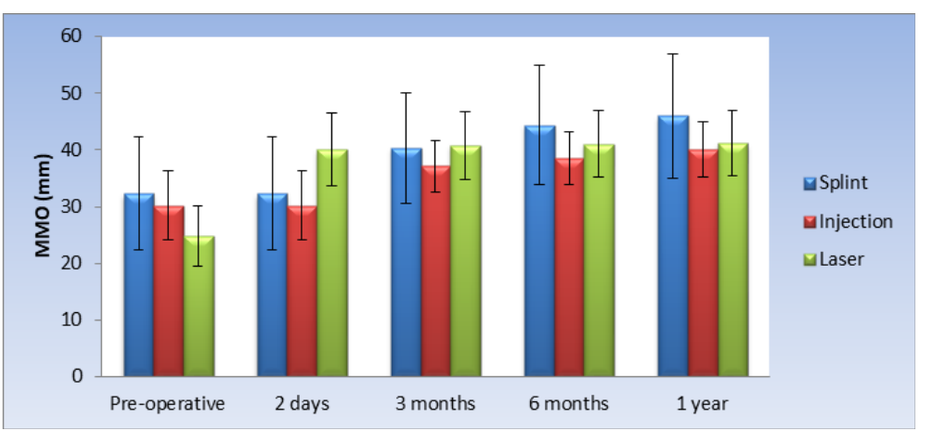


Figure 7: Bar chart representing mean and standard deviation values for MMO in the three groups

DISCUSSION

Conservative methods are usually the first treatment option in patients with TMDs (Okeson and Hayes, 1986; de Leeuw et al., 1994; de Leeuw et al., 1995). This begins with educating the patient and giving them advice to protect their TMJs, eat a soft diet, avoid parafunctional habits such as chewing gum, and maintain a healthy posture, etc. All the patients in the current study were informed about these points. [22,56,70] Splint therapy is one of the most controversial issues in the management of TMDs. [23,38] Different occlusal splint designs have been reported to be of worth in the management of TMDs. As their mechanism of action is still indefinite, the associated benefit is questionable. Seminal research conducted by Ramfjord and Ash has demonstrated that the Michigan splint offers temporary relief for muscle and joint discomfort. [64]

Moreover, Baldissara et al. presented compelling evidence about the prospective use of these splints in the management of craniomandibular diseases. [7] Flat plain splints may rapidly decrease nocturnal bruxism and sometimes, but not always, cause a decrease in maximum masticatory muscle activity. [7,16] Soft splints may diminish TMD-related headaches and clicking but their effect is not always significant, particularly in the long-term, and they can cause a worsening of symptoms in up to 26% of patients. [13,63]
Al-Ani et al. [39] examined the effectiveness of stabilization splint therapy in reducing symptoms in patients with TMDs. Stabilization splint thrapy was compared to acupuncture, bite plates, biofeedback/stress management, visual feedback, relaxation, jaw exercises, non-occluding appliance, and minimal/no treatment. There was no statistically significant difference in the efficacy of stabilizing splint (SS) therapy compared to other active therapies in improving symptoms in individuals with pain dysfunction syndrome. There was limited evidence indicating that the use of SS therapy for pain dysfunction syndrome may be advantageous in reducing the intensity of pain, both at rest and during palpation, as opposed to giving no treatment.

A different research project conducted by Turp J et al [72] aimed to address two clinical inquiries concerning individuals experiencing masticatory muscle pain: 1) Is there a substantial reduction in symptoms when using a full-coverage hard acrylic occlusal appliance (stabilization splint)? Furthermore, is the treatment success gained with a stabilization splint more significant compared to other treatment methods (including placebo treatment) or no treatment? Thirteen papers, comprising nine controlled clinical trials, were found. They concluded that considering the most reliable information now available, it seems that the use of a stabilizing splint is beneficial for most individuals experiencing masticatory muscle strain. Our current research demonstrated a statistically significant reduction in pain levels both at rest and during opening, following the use of a splint.

In favor of our results, the study conducted by Dao, Lavigne, Turk, and colleagues revealed a favorable treatment effect with SS therapy in individuals experiencing Myofascial TMD discomfort. [20] Ekberg et al. [25] provided evidence of the beneficial effects of a stabilizing appliance on several aspects, including the severity of Myofascial discomfort, pain experienced during mandibular movements, maximal opening capacity, and the number of trigger points located in the masticatory muscles.
However, Raphael et al. [65] concluded that oral splints were of modest value for patients with Myofascial face pain in their overall sample. The results of our study agree with those studies supporting the usefulness of occlusal splints in the management of Myofascial pain dysfunction syndrome. In our study, there was a statistically significant reduction in NRS scores at rest and during opening by time through the 1-year treatment follow-up in Group 1. They have also found that occlusal splints had decreased the VAS scores and the number of painful muscles in during a six-week follow-up study in patients with Myofascial pain.

Naikmasur, et al. [54] and Suvinen and Reade [69] have also shown 10.02 mm and 7.4 mm increase in MIO after splint therapy in MPDS patients. Wong and Cheng [76] achieved normal mouth opening (MIO ≥40 mm) in their patients by the end of treatment with combination of acupuncture with SS in addition to point injection therapy. Similarly, we achieved normal mouth opening (mean= 45.97 mm) at the end of the treatment follow-up in Group 1.
TP injections are effective in decreasing the pain and interrupting the vicious circle of spasm-pain-spasm [52] In this way, TPs are resolved. The frequency and number of injections are expressed in different studies. [12,29,33,60] Gazi et al. stated that they usually applied injections to the TPs of their patients once a week. They asserted that TPI was a successful treatment method in controlling the pain and that it had the same effect as acupuncture, physiotherapy, muscle relaxants, and analgesics. [29] This is like the current study which showed significant decrease in NRS at rest and on opening and a statistically significant increase in MMO using local anesthetic injections by the end of the 1-year follow-up period Gul and Onal[33] organized four groups of 100 patients. They administered transcutaneous electrical nerve stimulation (TENS) and laser to groups 1 and 2 and administered lidocaine and botulinum toxin A in groups 3 and 4. Lidocaine was applied 2 times per week (8 times in total) for each patient. Each TP injection was accompanied by 2 ml of 1% lidocaine (20 mg). Pain was evaluated at 1 day and at 15, 30, and 45 days. VAS, palpable muscle spasm rating (PMSR), and an-esthesiometry were used for the measurements. The investigators found that the lidocaine-injected group showed more diminishment in pain than the laser and TENS group in their study of MPS patients. [33] Our study also showed significant decrease in NRS at rest and on opening using local anesthetic injections by the end of the 1-year follow-up period. However, the results showed statistically significantly higher NRS at rest and on opening compared to the Laser group.

Low-power LASERs are frequently used to treat pain conditions of various kinds. Successful treatment effects have been reported for various musculoskeletal conditions including chronic orofacial pain. [12,60,62] In the literature till now, there is no agreement on the frequency of low-level LASERs and the number of sessions of LASER applications; Some authors discussed eight sessions with application twice per week. [29,33,60] On the other hand, some authors found that six sessions with application of twice per week would be proper, others agreed on 10 sessions. [14,68,74] In the current study 8 sessions were used like Bjordal et al. [9]

In our study, the application sites were through the overlying skin of the masseter. The parameters used was in accordance with Bozkurt et al, 2017. [11] In the literature, discussions on the effectiveness of LLLT are continuing. Many studies report that the use of LLLT in TMDs could be effective while others report that its effectiveness is not fully proven. Particularly, Emshoff et al. [26] and De Abreu Venancio et al. [73] reported that there was no relief in TMJ pain after the application of LLLT. Also, Petrucci et al. and other studies reported that LLLT is inadequate in reducing chronic TMJ pain. [17,61] Mazzetto et al., [49] Venezian et al. [74] followed up patients for 30 days after the last sessions of LASER application. Venezian et al. [74]reported that the reduction in pain continued to be statistically significant in this period. While Mazzetto et al. [49] reported that the least sensitivity to palpation was seen in the last LASER application session.

Lassemi et al. [44] followed up the patients for over 2 years and observed relevant results in pain reduction and clicking. Our results also show significant reduction in NRS scores throughout the 1-year follow-up period. In accordance with the current study, Ahrai F et al., 2014 [2] found that the efficacy of LLLT for the treatment of pain level & mouth opening in patients affected with myogenic TMD can produce a significant improvement in pain level & mouth opening.
Demirkol N et al., 2014 [24] found that, there was no significant difference between LLLT & occlusal splints groups after treatment. LLLT is an effective as occlusal splint for pain relief. Regarding the mouth opening, the current study showed significant improvement of mouth opening following laser application, this in accordance with the study of Ahari et al. who found that LLLT can produce a significant improvement in pain level and mouth opening in patients affected with myogenic TMD. [2] Our results are also comparable to the results of Nunez SC et al. who compared tennis (transcutaneous electrical neural stimulation) & LLLT and concluded that both methods are effective in improving the mouth opening. [55]

CONCLUSION:

Within the limitations of this study, the results indicated that the three methods were effective in reducing the pain and improving the mouth opening in MPDS patients.

CONFLICT OF INTEREST

This clinical study was self-funded by the authors, with no conflict of interest.

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