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EFFECTIVENESS OF JOINT MOBILIZATION AND LOW-POWER LASER AGAINST JOINT MOBILIZATION IN PEOPLE WITH TEMPOROMANDIBULAR DISORDERS IN A HOSPITAL FROM LIMA-PERU

EFECTIVIDAD DE LA MOVILIZACIÓN ARTICULAR Y LASER DE BAJA POTENCIA FRENTE A LA MOVILIZACIÓN ARTICULAR EN PERSONAS CON TRASTORNOS TEMPOROMANDIBULARES EN UN HOSPITAL DE LIMA-PERÚ

Miguel Ángel Norabuena-Robles[1,a], Alcylene Carla de Jesús dos Santos[2,b], Cristhian Santiago-Bazan[3,c]

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ABSTRACT

Introduction: Temporomandibular Disorders (TMD) are a major health problem in Peru. **Objective:** To determine the effectiveness of joint mobilization and low-power laser against joint mobilization in people with TMD, treated in a hospital located in Lima-Peru. **Methods:** Longitudinal study with a quantitative approach, with a non-probabilistic sampling of 197 participants diagnosed with temporomandibular disorders of both sexes, between 18 and 72 years old (median: 54, IR: 45-60), treated at the Hospital of the Hospital Central de las Fuerzas Aéreas del Perú. We took two groups of treatment into consideration: joint mobilization plus low-power laser (JMLPL) and only joint mobilization (JM). The outcomes were maximal unassisted mouth opening capacity (MUMO), pain at MUMO, and psychosocial aspects (depressive, anxious and somatic symptoms), evaluated at 2, 4 and 8 weeks, where nonparametric statistics was used. **Results:** Improvement was found in all outcomes measured in both groups ($p<0.05$) with the exception of depression. JMLPL was better than JM regarding pain at MUMO, MUMO only at 2 weeks, anxiety at 4 and 8 weeks and somatization only at 8 weeks. **Conclusion:** Improvements were found in reduction of pain at MUMO, MUMO and in the indexes of psychosocial aspects in both groups. JMLPL was better than only JM regarding pain at MUMO, MUMO only at 2 weeks, anxiety at 4 and 8 weeks, and somatization at 8 weeks.

Key words: Temporomandibular joint, Temporomandibular Joint Disorders, Laser Therapy (source: MeSH NLM).

RESUMEN

Introducción: Los trastornos temporomandibulares (TTM) constituyen un problema de salud importante en el Perú. **Objetivo:** Determinar la efectividad de la movilización articular y láser de baja potencia frente a la movilización articular en personas con TTM, atendidos en un hospital de Lima-Perú. **Métodos:** Estudio cuantitativo longitudinal, con una muestra no probabilística de 197 participantes diagnosticados con trastornos temporomandibulares, comprendidos entre 18 y 72 años (mediana: 54, RI: 45-60), de ambos sexos, atendidos en el hospital de la Fuerza Área del Perú. Se tuvo en consideración dos grupos de tratamiento: movilización articular más láser de baja potencia (LBPMA) y solo movilización articular (MA), los desenlaces fueron: la apertura bucal máxima no asistida (ABMNA), el dolor a la ABMNA y aspectos psicosociales (síntomas depresivos, ansiosos y de somatización), evaluados a las 2, 4 y 8 semanas, se usó estadística no paramétrica. **Resultados:** Se encontró mejoría en todos los desenlaces medidos en ambos grupos ($p<0,05$), a excepción de la depresión. LBPMA fue mejor que MA en dolor a la ABMNA, en ABMNA solo a las 2 semanas, ansiedad a las 4 y 8 semanas y somatización solo a las 8 semanas. **Conclusión:** Se encontró mejoras en la disminución del dolor a la ABMNA, la ABMNA y en los índices de los aspectos psicosociales en ambos grupos. El LBPMA fue mejor que sólo MA en el dolor a la ABMNA, la ABMNA sólo a las 2 semanas, ansiedad a las 4 y 8 semanas y somatización a las 8 semanas.

Palabras clave: Articulación temporomandibular; Trastornos de la articulación temporomandibular; Terapia por láser (fuente: DeCS BIREME).

[1] Hospital Central de la fuerza área del Perú, Lima-Perú.
[2] Universidade do Estado da Bahia, Salvador-Brasil.
[3] Centro de Rehabilitación Integral Física Funcional, Lima-Perú.
[a] Dental surgeon, [b] Physiotherapist, [c] Medical technologist, Doctor in education.

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INTRODUCTION

Temporomandibular disorders (TMD) belong to a group of signs and symptoms that cover numerous clinical problems and involve mandibular musculature, temporomandibular joints (TMJ) and its associated structures[1]. The presence of biological, anatomical, biomechanical, behavioral, environmental and/or emotional factors directly influence the masticatory system, unveiling and perpetuating symptoms and signs, constituting in a multifactorial and complex entity[2].

In Peru, it was reported that 57% of the population that was seen by a dentist presented some symptom of TMD and 27% relevant signs of TMD[3], in another study it was found that 68% of patients had some symptom of TMD, becoming an important health problem. The clinical management of TMD generally becomes a challenge for the health professional, either from the complexity of the condition or the little training professionals have which impacts their clinical decisions[4]. Among the conservative treatment options, we can find medications, occlusal splints, therapeutic exercises, pain education, joint mobilization and low-power laser with limited effectiveness if used alone.

Joint mobilization is characterized by the direct mechanical action over the components of TMJ, with short term effects, neurophysiologically stimulating mechanisms over cutaneous, muscular and joint receptors, improving movement, decreasing pain perception and consequently improving moods[5,6].

The word Laser is an acronym of Light Amplification by Stimulated Emission of Radiation, which is characterized by being monochromatic, unidirectional, coherent, non-divergent with high potency and intensity[7]. It offers a reparative and beneficial effect over the nervous tissue, skeletal muscle, soft tissue and skin. This therapy is indicated in illnesses of any of our economy system that undergo pain or tissue repair disorders. Every therapeutic procedure, as harmless as it may be, will always have its contraindications, which are divided into absolute and relative, due to the criteria we find in different schools[8].

While low-power laser is being used in dentistry for its great analgesic effect[9], joint mobilization has shown good results in the improvement of mouth opening and decreased pain[10,11]. Currently, no studies have been reported regarding the association of JMLPL and JM, for which reason this combination is suggested to evaluate the effectiveness of said association in the treatment of TMD and to provide a new treatment alternative to professionals within their multidisciplinary surroundings. Hence, the present has as an objective: to determine the effectiveness of JMLPL against JM in people with TMD.

METHODS

Design and setting

A longitudinal analytical study was performed with a quantitative prospective focus in the physical medicine and rehabilitation service of the Hospital Central de la Fuerza Aérea del Perú.

Population and sample

The population studied was made up of adults that were attended in the Physical Medicine and Rehabilitation Department of the Hospital Central de las Fuerzas Aéreas del Perú, "Comandante FAP Médico Juan Benavides Dorich".

We took into account the following inclusion criteria: accept to freely participate in the study after signing an informed consent, adults of both genders that upon clinical exam resulted with a myalgia and/or TMJ arthralgia diagnosis which included the study variables. Underage patients, people with congenital diseases and with high impact trauma to TMJ, with orthodontic treatment, with dental implants, with dental prosthesis and those that were undergoing dental treatment in the TMJ were excluded. People with moderate or severe cognitive decline and/or mental disorder, as well as those previously treated for TMD and/or complex systemic diseases previously evaluated by their practitioner were also excluded.

A convenience sampling was performed on patients attended in the Physical Medicine and Rehabilitation Department of the Hospital Central de las Fuerzas Aéreas del Perú, during the period of June to September 2018. The sample consisted of 197 patients.

Variables and instruments

We considered two groups of treatment: JMLPL (Group A) and only JM (Group B). The parameters evaluated were: the variation of the pain perception of maximum unassisted mouth opening (MUMO) (using the analog visual scale), the MUMO (measured with a millimeter ruler from the incisal edge of the superior central incisor to the incisal edge of the inferior central incisor) and the psychosocial factors

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(depression, anxiety and somatization symptoms), using the patient health questionnaires of the axis II of the Diagnostic Criteria for the TMD Research (RCD/TTD: PHQ-9, GAD-7, PHQ-15). Both instruments (EVA and RCD/TTD), have been validated in prior studies and in the Spanish language[4,11,12]. The analog visual scale corresponds to a horizontal line of 10 cm where the extreme left represents the absence of pain and the extreme right the maximum pain. For pain assessment we asked the person to mark a dot on the horizontal line after performing the MUMO to later be measured with a millimeter ruler and disclose its value. PHQ_9 is an instrument that measures the degree of depressive symptoms that consist of nine questions with four answer options rendering the following scores: 0-4, none or minimal; 5-9, mild; 10-14, moderate; 15-19, moderately severe and 20-27, severe. The GAD7 measures the degree of anxiety symptoms and consist of seven questions with four answer options rendering the following scores: 0-4: none or minimal, 5-9: mild, 10-14: moderate, 15-21: severe. The PHQ-15 measures the levels of somatic symptoms composed of 15 questions with four answer options and rendering the following scores: 0-4, none or minimal; 5-9, mild; 10-14, moderate y 15-30, severe somatic symptoms[1]. The result values were emptied into a data collection sheet where epidemiological variables (age, gender, marital status) and the study variables (MUMO measurement, pain at MUMO, and psychosocial factors associated with TMD) were considered. This instrument was validated through expert judgment assessment (9 total) and was subjected to a pilot study (Cronbach's alpha coefficient, 717 resulted acceptable according to Frias)[2], to evaluate its behavior in data collection.

Procedures

The patient intervention procedures were as follows: People came to the department referred by different practices, they underwent a clinical exam using RDC/TTD and the people that resulted with myalgia and/or arthralgia (with the study variables included) were invited to voluntarily participate in the study after signing an informed consent form.

Treatment began the same day they were accepted in the study with a frequency of 2 times per week with a duration of 15 minutes for JM and 21 minutes for JMLPL, each for 4 weeks. The procedure consisted of the low-power infrared laser application of 830 nm wavelength with an energy dose of 4 joule per cm2 and emission power of 200mw, in three points of the following muscles (1 minute per point): masseter (origin, body and insertion), temporal muscle (anterior, middle and posterior) and around TMJ (lateral pole), both the operator and the participant were protected with safety goggles. The joint mobilization consisted of manual techniques of joint mobilization at opening, closing and mandibular lateralization in the direction of the patient's symptomatology.

The procedure was performed taking the internal part of the mandible supporting the thumb in the molars on the TMJ side to be mobilized and holding by the external side (mandibular branch) performing opening, closing and lateralization movements with the remaining fingers. The effectiveness was evaluated after 2 and 4 weeks of treatment. After 4 weeks post treatment (8 weeks after initiating treatment), a reevaluation was performed to observe the behavior of the study variables.

Statistical analysis

A Stata version 14 program was used for the statistical analysis. The normality of the quantitative variables was evaluated, finding an abnormal distribution, for that reason they were represented by medians and interquartile ranges. Likewise, an inferential analysis was performed with Kruskal-Wallis test. On the other hand, the differences of basal scores were compared with the score at 2, 4, and 8 weeks for each treatment group, using the Mann-Whitney U test. We considered that the p-value <0.05 was statistically significant.

Ethical aspects

We took into consideration the bioethical criteria in the scientific investigation (autonomy, justice, beneficence and non-maleficence). We guaranteed the participant's right to privacy and free participation. Prior to the data collection we explained the importance of this study, its benefits and risks to the study's participants. In addition, the research project was evaluated by the Ethics Committee of the Universidad Nacional Mayor de San Marcos (Act N°1810) and obtained permit from the Hospital Central de las Fuerzas Aéreas del Perú (Charter N° NC-50HCDE N° 0137).

RESULTS

We first presented the descriptive analysis of the data and then the inferential analysis. We analyzed 197 (100%) records of patients seen in the Physical

Medicine and Rehabilitation Department of the Hospital Central de las Fuerzas Aéreas del Perú (Hospital Central FAP), 80 (40.6%) underwent conventional therapy (joint mobilization) and 117 (59.4%) underwent low-power laser therapy with joint mobilization. Out of all patients, 81% were women and the median age was 54 (interquartile range: 45-60; age range: 18-72).

In table 1 we observe a statistically significant difference between the basal score for pain to MUMO evaluation (with the visual analog scale) and the evaluation at 2, 4 and 8 weeks, in both treatment groups. On the other hand, we observed there was a mayor reduction in pain to MUMO in the JMLPL group, compared to JM at 2, 4 and 8 weeks.

In table 2 we observe a statistically significant difference between the basal score for pain to MUMO evaluation (with millimeter rule) and the evaluation at 2, 4 and 8 weeks, in both treatment groups. On the other hand, we observed a mayor improvement in MUMO in the JMLPL group, only at 2 weeks.

In table 3 we observe a statistically significant difference between the basal score for depression evaluation (with the PHQ-9 questionnaire) and the evaluation at 4 and 8 weeks, in the JMLPL group, and at 2 and 8 weeks in the JM group. On the other hand, we did not observe a mayor reduction in depression in the JMLPL group compared to JM.

In table 4 we observe a statistically significant difference between the basal score for anxiety evaluation (with the GAD7 questionnaire) and the evaluation at 2, 4 and 8 weeks, in both treatment groups. On the other hand, we also observed a mayor reduction in anxiety in the JMLPL group compared to JM at 4 and 8 weeks.

In table 5 we observe a statistically significant difference between the basal score for somatization evaluation (with the PHQ-15 questionnaire) and the evaluation 2, 4 and 8 weeks, in both treatment groups. On the other hand, we also observed a mayor reduction in somatization in the JMLPL group compared to JM alone at 8 weeks.

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Table 1. Effectiveness of joint mobilization and low-power laser against joint mobilization in the reduction of pain to maximum unassisted mouth opening (MUMO), in adults with temporomandibular disorders in a Hospital in Lima-Peru (n=197).

	Treatment plan			
Evaluation of pain at MUMO (with Analog Visual Scale)	**Laser with joint mobilization (n=117)**	**p-value***	**Joint mobilization (n=80)**	**p-value***
Eval. Pre-treatment	8 (6 – 8)	<0.001	7.5 (5 – 8)	<0.001
Eval. 2 wks.	4 (2 – 5)		4 (4 – 5)	
Eval.4 wks.	0 (0 – 2)		0 (0 – 2)	
Eval.8 wks.	0 (0 – 0)		0 (0 – 0)	

Difference between basal score and at:	**Laser with joint mobilization(n=117)**	**Joint mobilization (n=80)**	**p-value****
2 weeks	4 (2 – 5)	3 (2 – 4)	<0.001
4 weeks	6 (5 – 8)	6 (4 – 7)	<0.001
8 weeks	8 (6 – 8)	7 (5 – 8)	0.008

* Kruskal-Wallis test, Dunn's post hoc test found significant differences between the basal measurement and the evaluations at 2, 4 and 8 weeks.
** Mann-Whitney U test.

Table 2. Effectiveness of joint mobilization and low-power laser against joint mobilization for the maximum unassisted mouth opening (MUMO), in adults with temporomandibular disorders in a Hospital in Lima, Peru (n=197).

	Treatment Plan			
MUMO Evaluation (with millimeter ruler)	Laser with joint mobilization (n=117)	p-value*	Joint mobilization (n=80)	p-value*
Eval. Pre-treatment	40 (33 – 42)	<0.001	35 (33 – 40)	<0.001
Eval. 2 wks.	45 (44 – 47)		40 (38.5 – 42)	
Eval. 4 wks.	46 (46 – 47)		44 (44 – 47)	
Eval. 8 wks.	47 (47 – 48)		44 (44 – 47)	

Difference between basal score and at:	Laser with joint mobilization (n=117)	Joint mobilization (n=80)	p-value**
2 weeks	-7 (-10 – -3)	-5 (-7 – -2.5)	0.003
4 weeks	-8 (-11 – -6)	-9 (-13 – -5)	0.753
8 weeks	-8 (-13 – -6)	-9 (-12 – -4.5)	0.446

*Prueba de Kruskal-Wallis, la prueba post hoc de Dunn encontró diferencias significativas entre la medición basal y las evaluaciones a las 2, 4 y 8 semanas / ** U de Mann-Withney.

Table 3. Effectiveness of joint mobilization and low-power laser against joint mobilization related to depression in adults with temporomandibular disorders in a Hospital in Lima, Peru (n=197).

	Treatment plan			
Depression evaluation (with PHQ-9 questionnaire)	Laser with joint mobilization (n=117)	p-value*	Joint mobilization (n=80)	p-value**
Eval. Pre-treatment	7 (3 – 15)	<0,001	10 (3 – 14.5)	<0.001
Eval. 2 wks.	7 (4 – 12)		8 (3 – 12)	
Eval. 4 wks.	11 (7 – 13)		10 (6.5 – 16)	
Eval. 8 wks.	4 (1 – 5)		6 (1 – 9.5)	

Difference between basal score and at:	Laser with joint mobilization (n=117)	Joint mobilization (n=80)	p-value***
2 weeks	0 (-2 – 5)	1 (0 – 3)	0.157
4 weeks	-1 (-6 – 2)	0 (-3 – 2)	0.146
8 weeks	3 (0 – 6)	3 (0 – 6)	0.502

*Kruskal-Wallis test, Dunn's post hoc test found significant differences between basal measurement and the evaluations at 4 and 8 weeks.
** Kruskal-Wallis test, Dunn's post hoc test found significant differences between basal measurement and evaluations at 2 and 8 weeks.
*** Mann-Whitney U test.

Table 4. Effectiveness of joint mobilization and low-power laser against joint mobilization related to anxiety in adults with temporomandibular disorders in a Hospital in Lima, Peru (n=197).

Anxiety evaluation (with GAD7 questionnaire)	Treatment plan: Laser with joint mobilization (n=117)	p-value*	Joint mobilization (n=80)	p-value*
Eval. Pre-treatment	5 (2 – 7)	<0.001	5 (3,5 – 8)	<0.001
Eval. 2 wks.	7 (5 – 8)		8 (4 – 10)	
Eval. 4 wks.	3 (1 – 3)		4 (1 – 5)	
Eval. 8 wks.	2 (1 – 2)		4 (2 – 5)	

Differences between basal score and at:	Laser with joint mobilization (n=117)	Joint mobilization (n=80)	p-value**
2 weeks	-2 (-4 – 0)	-2 (-3.5 – 0)	0.856
4 weeks	2 (1 – 5)	1 (-1 – 2.5)	<0.001
8 weeks	3 (1 – 5)	1 (0 – 3)	<0.001

* Kruskal-Wallis test, Dunn's post hoc test found significant differences between basal measurement and evaluations at 2, 4 and 8 weeks.
** Mann-Whitney U test.

Table 5. Effectiveness of joint mobilization and low-power laser against joint mobilization related to somatization in adults with temporomandibular disorders in a Hospital in Lima, Peru (n=197).

Somatization evaluation (with PHQ-15 questionnaire)	Treatment plan: Laser with joint mobilization (n=117)	p-value*	Joint mobilization (n=80)	p-value*
Eval. Pre-treatment	3 (3 – 5)	<0.001	5 (1 – 7)	<0.001
Eval. 2 wks.	2 (0 – 2)		2 (0 – 3)	
Eval. 4 wks.	1 (1 – 1)		2 (0 – 2.5)	
Eval. 8 wks.	2 (1 – 2)		2 (0 – 3)	

Difference between basal score and at:	Laser with joint mobilization (n=117)	Joint mobilization (n=80)	p-value**
2 weeks	1 (1 – 3)	2 (0 – 3)	0.358
4 weeks	2 (1 – 3)	3 (0 – 4)	0.241
8 weeks	1 (0 – 2)	2 (0 – 3.5)	0.008

* Kruskal-Wallis test, Dunn's post hoc test found significant differences between basal measurement and the evaluations at 2, 4 and 8 weeks.
** Mann-Whitney U test.

DISCUSSION

The research's aim was to determine the effectiveness of JMLPL against JM in people with temporomandibular joint disease (TMD) seen in a hospital in Peru. In the first place, the results reported changes in the scores of the study's variables in both treatment plans. We observed that pain perception to MUMO decreased significantly in the JMLPL treatment plan with respect to JM. This concords with previous diverse reports[13-17], which reveal that low-power laser is effective in the decrease of pain perception and improves the mandibular functionality reducing the treatment duration.

Also, regarding mandibular movement to MUMO, in the JMLPL treatment plan it was greater than JM only in the second week, these results are similar to the studies by Mazzeto et al.[16] and Salmos et al.[15] where it was shown that laser can be used as support in temporomandibular disorder treatments significantly improving mandibular movements in a short period, since this result was not observed at 4 and 8 weeks.

Furthermore, we did not observe a major improvement in psychosocial aspects in the JMLPL group against JM (depressive, somatic and anxiety symptoms) at 2 weeks, but as of 4 weeks with respect to anxiety and at 8 weeks with respect to somatization and in the case of depression, improvement of JMLPL against JM was not observed. The modification of variables may be due to effects outside to treatment, such as mean regression, where pain behaves cyclically and moves towards a central tendency as time progresses[20,21]. Likewise, the diseases' natural history refers that a pain which doesn't pose a serious threat to a person might suggest a favorable disease prognosis[22]. Given these conditions, people can perform functional activities such as: language, mastication and swallowing without trouble, allowing for mouth opening, pain perception and psychosocial aspects to consequently improve. Another aspect to consider is the patient's self-confidence which allows coping including in the presence of symptoms[23,24].

Due to the complexity that TMDs represent, it is necessary to perform larger scale studies of joint mobilization and low-power laser or combine them with other treatments and limit studies that only include unimodal approaches such as electrotherapy, ultrasound and occlusal splints, which have shown to be ineffective in avoiding the excessive use of medications.

The use of joint mobilization and low-power laser is of utmost importance in the treatment of TMD as a non-invasive strategy and every time we rule out red flags upon clinical exam. In addition to treatment, we incorporate pain education, home self-management exercises, stress control mechanisms, sleep hygiene and healthy lifestyles.

Lastly, we emphasize the need further research of people with TMD in the sample size, duration of the study, evaluation of results and assignment method to determine therapeutic efficacy and validity of joint mobilization and low-power laser. The present study's limitations were non-randomization of treatment groups and non-inclusion of confounding factors.

CONCLUSION

There were improvements in the decreased pain upon maximum unassisted mouth opening and in the indices of the psychosocial aspects in both groups. Joint mobilization and low-power laser were better than only joint mobilization for pain during maximum unassisted mouth opening, in maximal unassisted mouth opening at 2 weeks, anxiety at 4 and 8 weeks and somatization at 8 weeks. However, more studies are needed to confirm these results.

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Correspondence: *Cristhian Santiago Bazán.*
Address: *Jr. Tiahuanaco 1493 Urb. Zárate S.J.L., Lima-Perú.*
Telephone number: *941703104*
E-mail: *cristhiansantiagob@gmail.com*

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