International Journal of Clinical Trials
Alqahtani AM et al. Int J Clin Trials. 2023 Nov;10(4):282-290
http://www.ijclinicaltrials.com
pISSN 2349-3240 | eISSN 2349-3259
DOI: https://dx.doi.org/10.18203/2349-3259.ijct20233170

Original Research Article

The efficacy of combining low-level laser therapy with oral motor exercises in patients with temporomandibular disorders (pilot study)

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Received: 21 July 2023
Revised: 05 October 2023
Accepted: 09 October 2023

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ABSTRACT

Background: The term temporomandibular disorders (TMDs) is used for clinical signs and symptoms affecting the masticatory muscles, temporomandibular joints (TMJs) and associated structures or both. TMDs may present clinically with facial pain in the region of the TMJs and/or muscles of mastication, limitation in mouth opening, and TMJ clicking during mastication. Treatment of TMDs includes occlusal splints, drug therapy, physiotherapy, auriculotherapy and low-level laser therapy (LLLT).
Methods: Ten patients with TMD were recruited from the Oral Medicine clinics at Prince Sultan Military Medical City. The participants were randomly allocated into two equal groups. All participants attended a total of eight laser treatment sessions using a 940 nm diode laser. The deep-tissue laser hand-piece was applied perpendicular to the Temporalis muscle, Masseter muscle and TMJ region bilaterally. Patients in the second group attended physiotherapy sessions in addition to the laser sessions. Participants were evaluated for range of mandibular movement, pain, and tenderness to palpation before treatment, one-week post-treatment, and thirty days after treatment completion.
Results: This study, being a pilot study, was conducted in a comparatively small number of patients. It allowed for the assessment of research feasibility, methodology, limitations, and preliminary outcomes. Moreover, variations in the response to treatment were observed between the two groups, with results of this study supporting previous findings that LLLT is an effective treatment for TMD symptoms, tenderness to palpation, as well as improving jaw functional behavior.
Conclusions: Therefore, LLLT therapy may be a promising tool for the management of TMD, especially when combined with physiotherapy.

Keywords: Temporomandibular disorders, Low-level laser therapy, Muscle exercise, Temporomandibular joint

INTRODUCTION

Temporomandibular disorders (TMDs) are a group of musculoskeletal disorders and neuromuscular conditions occurring in the temporomandibular joint region, masticatory musculature, and associated structures and presents clinically with pain in the region of the TMJs and/or muscles of mastication, limitation in mouth opening, and TMJ sounds such as clicking during jaw opening or mastication.[1] Several etiological factors such as parafunctional habits, emotional stress, occlusal disharmony and trauma have been identified. TMDs are the most common chronic orofacial pain condition, with higher prevalence in women than in men.[2,3] The prevalence of TMDs is low in young patients, but increases with age among adolescents up to young adulthood.[4]

Temporomandibular disorders may easily become a chronic disease accompanied with migraines, fibromyalgia, and depression, which consequently affect quality of life, thus appropriate TMDs treatment and prevention is critical.[5] Treatment of TMDs has several therapeutic approaches including occlusal splints, drug therapy, physiotherapy, auriculotherapy, posture training, psychotherapy and low-level laser therapy (LLLT).[6]

The aim of our study is to investigate the efficacy of combination therapy (LLLT and oral motor exercises) in the treatment of TMDs compared to LLLT alone. In order to be able to establish such a large-scale study in a tertiary hospital in Riyadh, Saudi Arabia, a pilot study was first designed and conducted.

METHODS

This pilot study was carried out in the oral medicine clinics at Prince Sultan Military Medical City (PSMMC), Riyadh, Saudi Arabia. Male and female patients with temporomandibular disorders of more than six-months duration were examined. Radiographic imaging including panoramic radiographs and magnetic resonance imaging (MRI) of the temporomandibular joints were requested and the results were reviewed prior to initiation of any treatment. Ten patients were assigned by a systematic random sampling method into one of the two groups; group 1 (5 patients treated using low power laser therapy alone), group 2 (5 patients treated using low power laser therapy and OM-exercises), according to the following inclusion and exclusion criteria:

Inclusion criteria

Adults aged 18 to 60 years, diagnosed with TMDs using the DC/TMD examination form (Figure 1) and research diagnostic criteria for temporomandibular disorders were included (Figure 2).[7]

Exclusion criteria

Patients younger than 18-years-old or older than 60-years-old, pregnant and lactating women, patients diagnosed with dental pain or periodontal problems, patients diagnosed with neurological and psychiatric disorders, previous trauma in the head and neck region, patients with history of prosthodontic rehabilitation or current orthodontic treatment, patients suffering from musculoskeletal syndromes, autoimmune illness or neoplasia in the head and neck region, and patients on medications that interfere with pain perception (e.g., analgesics, anti-inflammatories, psychiatric drugs and muscle relaxants) within the past month were excluded. Ethical approval for the study was obtained from the Institutional Review Board (IRB) at PSMMC. Written agreement consent was obtained from all participants prior to starting the research. The objectives of the study were explained to the participants with stressing on the importance of the data and its confidentiality, no obligation to participate and the right to withdraw at any time.

The participants were first interviewed and their demographic data, TMD symptoms, oral behavior and jaw function limitations were recorded using the graded chronic pain scale (Figure 3), oral behavior checklist (Figure 4) and jaw function limitation scale (Figure 5). This was followed by thorough clinical extra-oral and intra-oral examination. Pressure was applied to the temporalis, masseter, lateral pterygoid, medial pterygoid muscles and to the temporomandibular joints bilaterally. A SF-100 Digital Force Gauge (Vikye™) was used when applying pressure to the TMJs, temporalis muscle and masseter muscles. Severity of pain was assessed by using visual analogue scale (VAS). Whereas, the patient was asked to rate the intensity of the pain by choosing a number between 0 (no pain) and 10 (highest intensity) before and during palpation. Range of mandibular movements (vertical and lateral jaw movements) were recorded.

All patients attended a total of 8 laser treatment sessions (2 sessions per week for four consecutive weeks). A low-level diode laser device was used with 4W power, continuous emission mode and a wavelength of 940 nm (Epic Biolase, Irvine, CA). The laser light was applied using a deep-tissue hand-piece and a disposable non-sterile shield for single patient use. The hand-piece was applied perpendicular to the tissue to be irradiated and moved in a circular motion (Figure 6) over three points of the superficial bundle of the master muscle (upper, middle and the lower portion), three points of the temporalis muscle (anterior, middle and posterior portion), and the TMJ region (four points forming a cross and one central point). Each session included bilateral treatment of 150 seconds/side. Sessions were performed at 72-h intervals, excluding weekends. All required safety measures, including wearing protective goggles, securing the operatory field and avoiding sudden movement were applied throughout the procedure.

Patients in the second group attended a physiotherapy session immediately after receiving laser treatment. Physiotherapy treatment was delivered for 30 min per session, two times per week with a total of 8 sessions per patient. The treatment included masseter and temporalis massage, stretching exercises for the masseter, medial pterygoid, lateral pterygoid and temporalis muscles, and masticatory muscles strengthening exercises. The patients were asked to repeat these exercises seated in a chair in front of a mirror, for one minute each. They were also instructed to repeat these exercises at home three times per day.

Participants were evaluated for the range of mandibular movement, pain, and tenderness to palpation, using the craniomandibular index (CMI)[8] at baseline (before treatment), one-week after completing the 8 sessions of treatment, and 30 days after treatment completion. All data were recorded in respective data sheets.

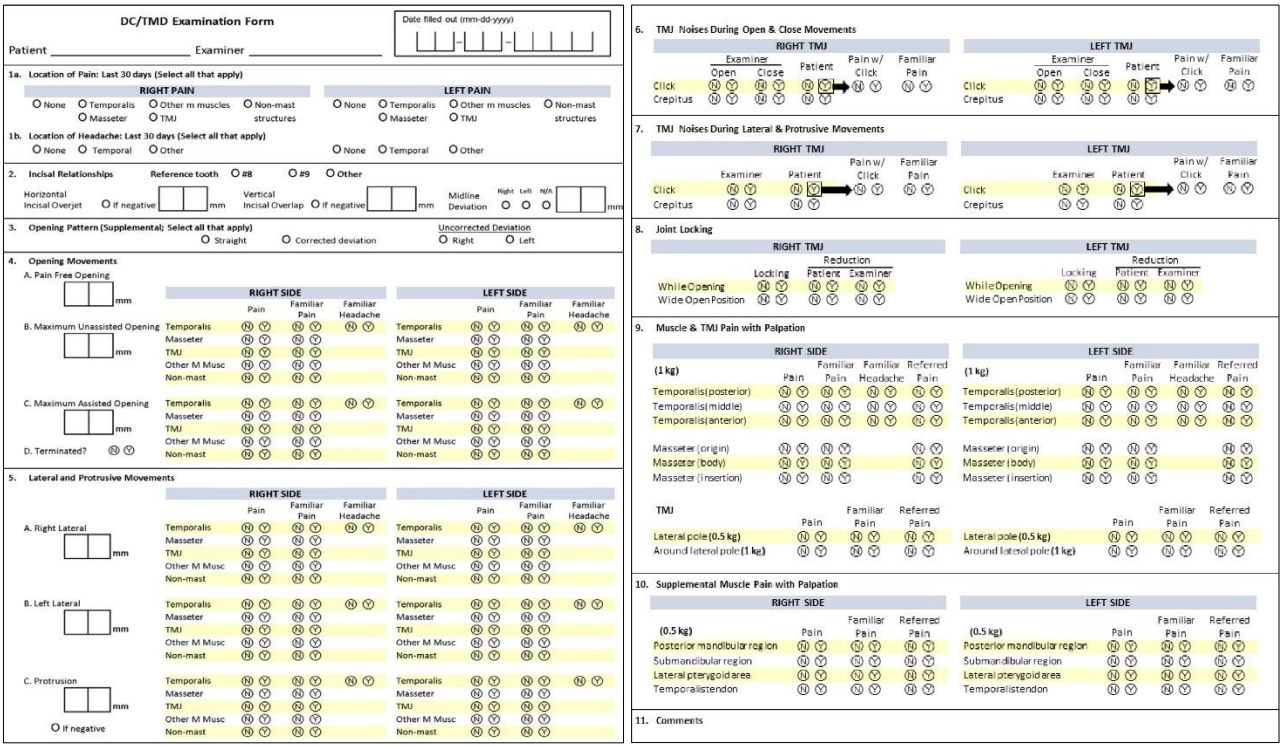


Figure 1: DC/TMD examination form.[7]

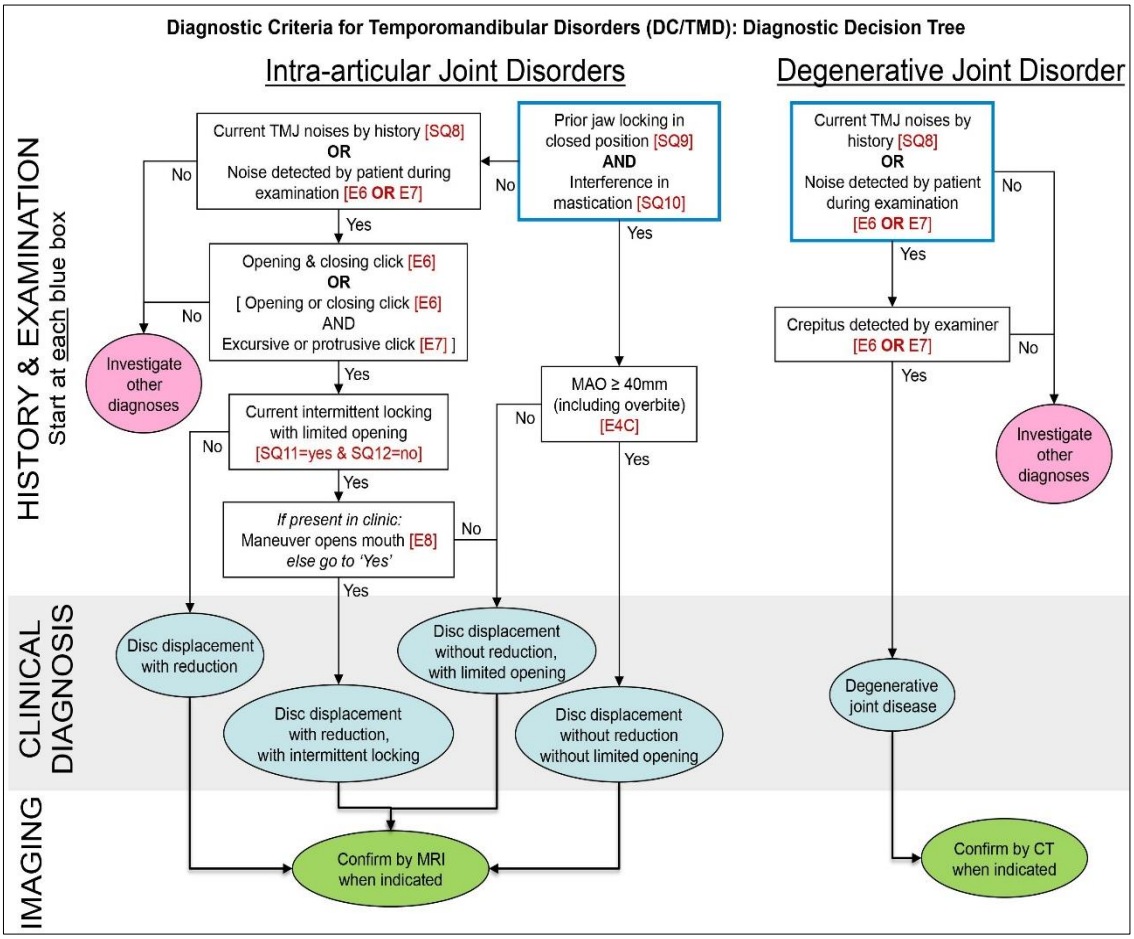
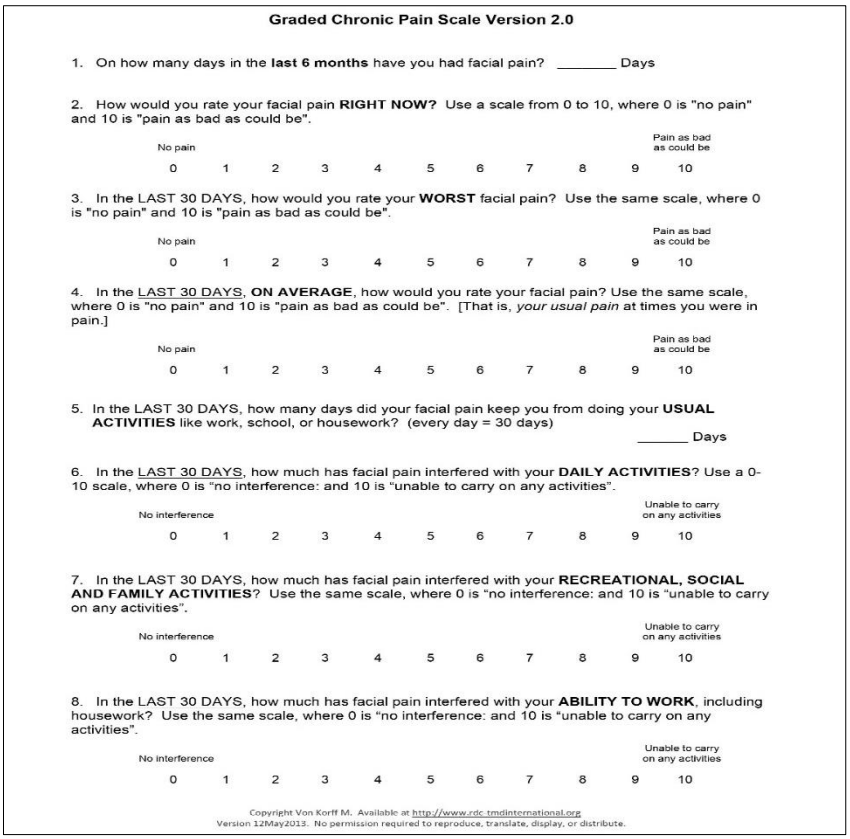


Figure 2: Research diagnostic criteria for temporomandibular disorders.[7]



Graded Chronic Pain Scale Version 2.0

1. On how many days in the **last 6 months** have you had facial pain? _____ Days

2. How would you rate your facial pain **RIGHT NOW?** Use a scale from 0 to 10, where 0 is "no pain" and 10 is "pain as bad as could be".

No pain — Pain as bad as could be

0 1 2 3 4 5 6 7 8 9 10

3. In the LAST 30 DAYS, how would you rate your **WORST** facial pain? Use the same scale, where 0 is "no pain" and 10 is "pain as bad as could be".

No pain — Pain as bad as could be

0 1 2 3 4 5 6 7 8 9 10

4. In the LAST 30 DAYS, **ON AVERAGE**, how would you rate your facial pain? Use the same scale, where 0 is "no pain" and 10 is "pain as bad as could be". [That is, *your usual pain* at times you were in pain.]

No pain — Pain as bad as could be

0 1 2 3 4 5 6 7 8 9 10

5. In the LAST 30 DAYS, how many days did your facial pain keep you from doing your **USUAL ACTIVITIES** like work, school, or housework? (every day = 30 days)

_____ Days

6. In the LAST 30 DAYS, how much has facial pain interfered with your **DAILY ACTIVITIES**? Use a 0-10 scale, where 0 is "no interference: and 10 is "unable to carry on any activities".

No interference — Unable to carry on any activities

0 1 2 3 4 5 6 7 8 9 10

7. In the LAST 30 DAYS, how much has facial pain interfered with your **RECREATIONAL, SOCIAL AND FAMILY ACTIVITIES**? Use the same scale, where 0 is "no interference: and 10 is "unable to carry on any activities".

No interference — Unable to carry on any activities

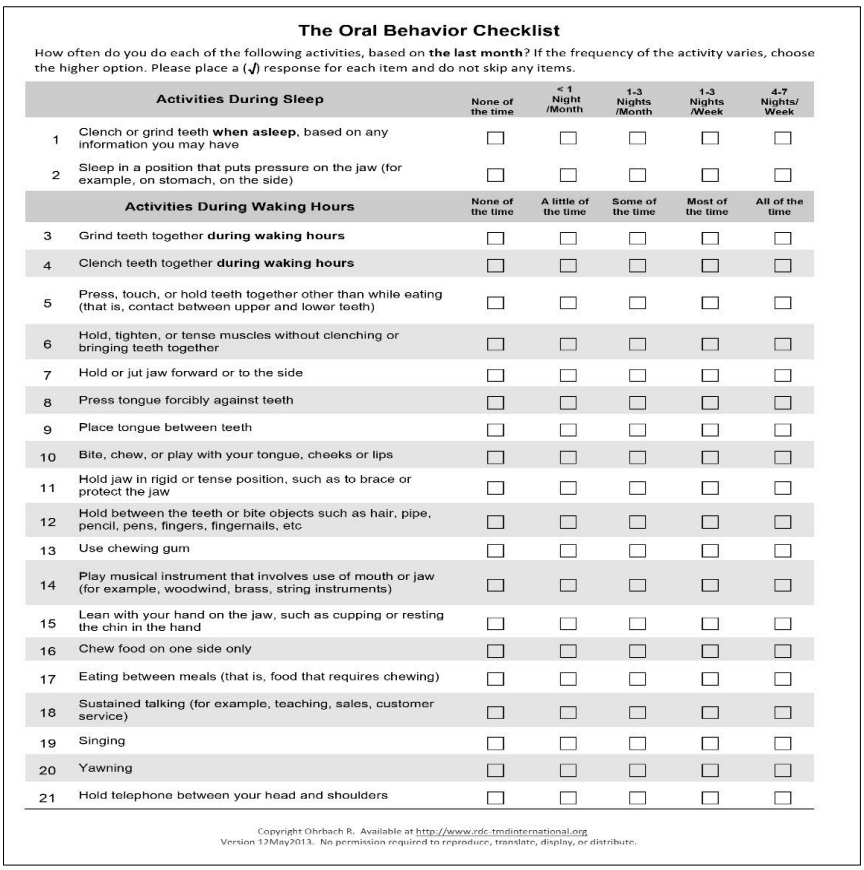
0 1 2 3 4 5 6 7 8 9 10

8. In the LAST 30 DAYS, how much has facial pain interfered with your **ABILITY TO WORK**, including housework? Use the same scale, where 0 is "no interference: and 10 is "unable to carry on any activities".

No interference — Unable to carry on any activities

0 1 2 3 4 5 6 7 8 9 10

Figure 3: Graded chronic pain scale.[22]



The Oral Behavior Checklist

How often do you do each of the following activities, based on **the last month**? If the frequency of the activity varies, choose the higher option. Please place a (√) response for each item and do not skip any items.

	Activities During Sleep	None of the time	< 1 Night /Month	1-3 Nights /Month	1-3 Nights /Week	4-7 Nights/ Week
1	Clench or grind teeth **when asleep**, based on any information you may have	☐	☐	☐	☐	☐
2	Sleep in a position that puts pressure on the jaw (for example, on stomach, on the side)	☐	☐	☐	☐	☐
	Activities During Waking Hours	**None of the time**	**A little of the time**	**Some of the time**	**Most of the time**	**All of the time**
3	Grind teeth together **during waking hours**	☐	☐	☐	☐	☐
4	Clench teeth together **during waking hours**	☐	☐	☐	☐	☐
5	Press, touch, or hold teeth together other than while eating (that is, contact between upper and lower teeth)	☐	☐	☐	☐	☐
6	Hold, tighten, or tense muscles without clenching or bringing teeth together	☐	☐	☐	☐	☐
7	Hold or jut jaw forward or to the side	☐	☐	☐	☐	☐
8	Press tongue forcibly against teeth	☐	☐	☐	☐	☐
9	Place tongue between teeth	☐	☐	☐	☐	☐
10	Bite, chew, or play with your tongue, cheeks or lips	☐	☐	☐	☐	☐
11	Hold jaw in rigid or tense position, such as to brace or protect the jaw	☐	☐	☐	☐	☐
12	Hold between the teeth or bite objects such as hair, pipe, pencil, pens, fingers, fingernails, etc	☐	☐	☐	☐	☐
13	Use chewing gum	☐	☐	☐	☐	☐
14	Play musical instrument that involves use of mouth or jaw (for example, woodwind, brass, string instruments)	☐	☐	☐	☐	☐
15	Lean with your hand on the jaw, such as cupping or resting the chin in the hand	☐	☐	☐	☐	☐
16	Chew food on one side only	☐	☐	☐	☐	☐
17	Eating between meals (that is, food that requires chewing)	☐	☐	☐	☐	☐
18	Sustained talking (for example, teaching, sales, customer service)	☐	☐	☐	☐	☐
19	Singing	☐	☐	☐	☐	☐
20	Yawning	☐	☐	☐	☐	☐
21	Hold telephone between your head and shoulders	☐	☐	☐	☐	☐

Figure 4: Oral behavior checklist.[22]

Jaw Functional Limitation Scale

For each of the items below, please indicate the level of limitation **during the last month**. If the activity has been completely avoided because it is too difficult, then circle '10'. If you avoid an activity for reasons other than pain or difficulty, leave the item blank.

		No limitation										Severe Limitation
1.	Chew tough food	0	1	2	3	4	5	6	7	8	9	10
2.	Chew chicken (e.g., prepared in oven)	0	1	2	3	4	5	6	7	8	9	10
3.	Eat soft food requiring no chewing (e.g., mashed potatoes, apple sauce, pudding, pureed food)	0	1	2	3	4	5	6	7	8	9	10
4.	Open wide enough to drink from a cup	0	1	2	3	4	5	6	7	8	9	10
5.	Swallow	0	1	2	3	4	5	6	7	8	9	10
6.	Yawn	0	1	2	3	4	5	6	7	8	9	10
7.	Talk	0	1	2	3	4	5	6	7	8	9	10
8.	Smile	0	1	2	3	4	5	6	7	8	9	10

Figure 5: Jaw functional limitation scale.[22]

Figure 6: Deep-tissue laser hand piece applied perpendicular to the tissue to be irradiated and moved in a circular motion.

In order to avoid inter-examiner variability, one dental practitioner performed all clinical examination while the other performed the laser therapy. Physiotherapy treatment was delivered by a single experienced physiotherapist.

RESULTS

A total of ten patients completed all treatment sessions and follow-up visits (8 female and 2 male). Their ages ranged between 20 years and 52 years of age (mean=35.4 years, median=34.5 years) and all patients were of Saudi nationality (Table 1).

MRI of the TMJs for patients included in group 1 (receiving laser therapy only) showed normal morphology, signal intensity and position of the discs in the closed and open mouth views bilaterally (no anterior subluxation). There were no erosions or joint effusions and no abnormal bone marrow signal intensity. The lateral pterygoid muscles were unremarkable. Two patients showed no limitation of anterior mandibular translation in the provided dynamic images. On the other hand, the remaining three patients showed limitation of mandibular condyle anterior translation with open mouth view, being mild in two patients and severe in the last.

Table 1: Patients' demographic data.

Patient no.	Group	Gender	Age
1	Laser	Female	52
2	Laser	Male	39
3	Laser	Female	47
4	Laser	Female	32
5	Laser	Female	20
6	Laser and physiotherapy	Male	27
7	Laser and physiotherapy	Female	48
8	Laser and physiotherapy	Female	20
9	Laser and physiotherapy	Female	34
10	Laser and physiotherapy	Female	35

MRI of the TMJs for patients included in group 2 (receiving both laser therapy and OM-exercises) showed normal morphology, signal intensity and position of the discs in the closed and open mouth views bilaterally in three patients. The MRI of the other two patients revealed left TMJ disc with anterior subluxation in closed mouth view. One patient had normal reduction in open mouth views while the other did not. There were no erosions or joint effusions and no abnormal bone marrow signal intensity in any of the patients in this group.

Due to the fact that this was a pilot study with a small sample number, descriptive statistics were used. This method allows for recording and presenting data of the study groups without inferring properties about a larger population, yet allowing us to gain insights to the difficulties, limitations, and possible outcomes of the actual large-scale study prior to its implementation.

Accordingly, modification of patient recruitment methodology, assessment tools used, laser device parameters or physiotherapy technique could be suggested.

According to the oral behavior checklist (Figure 4) filled out for each patient prior to treatment, three patients from group 1 reported clenching or grinding teeth when asleep, two of whom also reported sleeping in a position that puts pressure on the jaw. Three patients reported chewing gum occasionally and four patients reported eating food on one side of the mouth only. On the other hand, two patients from group 2 reported clenching or grinding teeth when asleep, both of whom reported sleeping in a position that puts pressure on the jaw. One patient reported chewing gum some of the time and three patients reported eating food on one side of the mouth only.

Using the jaw functional limitation scale (Figure 5), laser therapy was found to decrease the limitation, caused by pain or difficulty, when chewing hard food in all patients, reaching zero (no limitation) at the one-month post-laser treatment session. All patients in group 1 reported limitation, caused by pain or difficulty, upon yawning within the month before starting laser therapy. At the one-month post-laser treatment session, they all experienced reduced limitation when yawning, with two patients reaching zero on the jaw functional limitation scale. Meanwhile, only two patients from group 2 reported limitation upon yawning before starting laser therapy, with some improvement at the one-month post-laser treatment session. Two patients from group 1 and one patient from group 2 experienced limitation when talking before starting laser therapy. This limitation disappeared completely for the two patients in group 1 and reduced in the patient from group 2. As for limitation when opening wide enough to drink from a cup, two patients from group 1 and another two patients from group 2 experienced some limitation prior to treatment. This limitation disappeared completely for the two patients in group 1 and reduced in the two patients from group 2.

With regards to self-reported pain perception; three out of the five patients in group 1 reported pain reduction during the one-week post-laser follow-up session and no pain after completion of therapy. While two patients reported no improvement during the one-week post-laser follow-up session presenting with bilateral pain in the TMJs, with one of them showing persistent pain at the one-month post-laser follow-up session. As for patients in group 2, all five patients experienced pain reduction during the one-week post-laser and physiotherapy follow-up session. However, at the one-month post-laser follow-up session, two patients reported recurrence of pain but in a different location from that reported pre-treatment; with one complaining of bilateral temporal pain while the other complaining of bilateral TMJ pain.

Three patients from group 1 reported headache prior to initiation of the therapy, with two of them not showing improvement until the one-month post-laser follow-up session. The third patient reported disappearance of the headache at the one-week post-laser follow-up session but reported recurrence when attending the one-month post-laser follow-up session. As for patients in group 2, four patients reported headache prior to initiation of the therapy, with two patients showing improvement from the one-week post-laser follow-up session onward and the other two not showing improvement until the one-month post-laser follow-up session.

Prior to treatment, TMJ clicking was noticed in two patients from each group. It disappeared at the one-week post-laser follow-up session and was still absent one month later.

Maximum assisted and unassisted mouth opening increased from the one-week post-laser follow-up session onward in all patients in group 1, except for one patient who experienced reduction. The increase ranged from 5 mm to 15 mm for the assisted mouth opening and from 5 mm to 10 mm for the unassisted mouth opening. On the other hand, maximum assisted and unassisted mouth opening increased from the one-week post-laser follow-up session onward in all patients in group 2. The increase ranged from 5 mm to 20 mm for the assisted mouth opening and from 5 mm to 16 mm for the unassisted mouth opening.

When examining lateral and protrusive mandibular movements in patients from group 1, some or no improvement was observed during the one-week post-laser follow-up session, while significant improvement was observed at the one-month post-laser follow-up session for all but one patient. As for the patients in group 2, improvement was observed during the one-week post-laser follow-up session in all but one patient, with maintenance or further improvement of their lateral and protrusive mandibular movements at the one-month post-laser follow-up session.

Upon palpation, all patients showed reduction of masticatory muscle tenderness at the one-week post-laser follow-up session and maintained the result at the one-month post-laser follow-up session. Prior to treatment, three patients from group 1 and four patients from group 2 experienced TMJ tenderness upon palpation. The tenderness showed improvement at the one-week post and at the one-month post-laser follow-up sessions, except for two patients in group 1 who experienced persistent tenderness.

None of the study participants from both groups experienced joint locking pre-treatment or during post-treatment follow-ups. Participants' mandibular opening pattern did not change throughout the study. Moreover, when measuring horizontal incisal overjet, vertical incisal overlap and median deviation, no change was observed in the occlusion of both groups.

Therefore, the results of this pilot study indicate that LLLT was effective in reducing TMD pain, improving maximum mouth opening and decreasing the limitation, caused by pain or difficulty, when chewing hard food, yawning, talking and opening wide enough to drink from a cup. Furthermore, all patients showed reduction of masticatory muscle tenderness at 1-week post-laser treatment and maintained the result after one month. TMJ clicking disappeared while horizontal incisal overjet, vertical incisal overlap and median deviation showed no changes after LLLT in both groups.

Interestingly, a greater increase in maximum assisted and unassisted mouth opening, improvement in lateral and protrusive mandibular movements, reduced TMJ tenderness and greater reduction in headache symptoms was observed when LLLT was used in combination with physiotherapy.

DISCUSSION

Temporomandibular disorders have a multifactorial etiology and may present clinically with a variety of symptoms including, but not limited to, auricular and facial pain, headaches, limited range of mandibular motion, and TMJ clicking sounds.[5]

TMDs have a higher prevalence in women than in men[2]. This may be due to hormonal changes that occur during the menstrual cycle which may lead to an increase in the perception of pain.[3] Magri et al when examining the use of LLLT in women with painful TMDs, reported that women using contraceptive pills had lower pain threshold than women who did not use contraceptive pills.[9] This could explain the fact that the number of female patients referred to our clinic during the patient recruitment period was much greater than that of the male patients.

Various methods of treatment have been proposed for the management of TMD signs and symptoms with occlusal splint being the most common therapy. Effects of other modalities such as acupuncture, kinesiotherapy, massage therapy, posture training, psychotherapy, joint mobilization, drug therapy, and low-level laser therapy (LLLT) have also been investigated.[2,6] Various studies proved that approaches such as counseling and physical therapy, including relaxation, massage, masticatory muscle exercises, and low-level laser therapy (LLLT), alone or in combined form may lead to pain relief and enhancement of jaw movements in TMD patients.[10,11]

Exercise therapy is useful for the rehabilitation of patients with musculoskeletal disorders, and it is commonly used in a variety of painful conditions, that leads to a decrease in pain perception.[12] This is possibly due to the stimulated release of pain-relieving peptides that include non-opioid compounds (e.g., serotonin, norepinephrine) and endogenous opioid substances, typically measured by changes in plasma β-endorphin levels.[13]

Many studies have found that Oral Motor (OM) exercises were used not only to alleviate pain, but to rehabilitate orofacial movements and functions such as swallowing and mastication.[14,15] A recent Korean study considered muscle exercise therapy in treating TMDs patients and found that muscle exercise treatment improves function significantly in adult TMD patients compared to conservative treatment such as patient education or analgesic agents. Moreover, this study also found that the use of physiotherapy as an add-on to usual conservative treatments (acupuncture and Chuna manual therapy) improved pain and function.[16]

Although there is no clear scientific evidence for the actual mechanisms of LLLT, theories were set out to describe therapeutic consequences which can change cell functions, such as reduction in bradykinin expression, edema, pain substances and inflammation time as well as increases in beta-endorphins and blood flow, the release of histamine and the promotion of muscle relaxation.[17,18] Additionally, the anti-inflammatory effect of laser can be due to its action on C nerve fibers which diminishes the permeability of the membrane to sodium and potassium, leading to slower nerve stimulation.[19,20]

It has been stated throughout the literature, despite differences in wavelength and energy density used, that LLLT has beneficial effects on TMDs. In a meta-analysis, Chen et al concluded that LLLT has limited efficacy in reducing pain, but could significantly improve the range of jaw movements of patients with TMDs, while a recent systematic review of 31 RCTs, by Xu et al suggested that LLLT effectively relieves pain and improves functional outcomes in patients with TMD.[21,22] Noteworthy, there is lack of standardization with regards to laser parameters, number of sessions, regions to be irradiated between the various RCTs. Hence, there is currently no evidence regarding the ideal LLLT technique for TMDs management.[23]

A randomized controlled study conducted in Brazil by Machado et al found that LLLT combined with OM-exercises was more effective in promoting TMD rehabilitation with regard of decreasing signs and symptoms as well as functional recovery compared to laser alone, but not better than full OMT protocol (OM-exercises associated with strategies as relaxation, hot compress, and massage techniques).[24] We observed LLLT treatment being effective in both reducing TMD pain and improving maximum mouth opening in TMD patients, in agreement with the study by Ahrari et al and contrary to a recent study by Yanik and Polat in 2020, where they found no changes in mouth opening and masticatory efficiency after LLLT.[25,26] Moreover, improvement of TMJ clicking was noted in both groups 1 and 2, in agreement with the study by Desai et al.[27]

Our results showed some improvement with regards to headache symptoms, showing better results when LLLT was used in combination with physiotherapy. These

findings are consistent with two previously published studies using the same modality of treatment.[24,28] However, disagreeing with Godoy et al who in 2017 found no significant differences after laser application alone.[28]

Laser therapy was found to decrease the limitation caused by pain or difficulty when chewing hard food, yawning, talking and opening wide enough to drink from a cup in both groups. These findings were also noted in previous published systematic reviews.[22,29] However, when assessing a successful treatment of TMD, it is not easy to determine whether a decrease in pain is a real result of the treatment or a cyclic spontaneous remission of symptoms.[30] Patients in group 1 experienced better results, according to the jaw functional limitation scale, than patients in group 2. This may be due to the fact that two patients in group 2 had left TMJ disc anterior subluxation. However, group 2 patients showed better improvement in their right and left lateral and protrusive mandibular movements. This may be in agreement with the American Academy of craniomandibular disorders in considering physical therapy as a main treatment modality for TMD management.[31]

CONCLUSION

With this being a pilot study, limitations, compliance, and preliminary outcomes were assessed in order to allow for necessary modifications when implementing the larger-scale study needed to reach statistically significant results. The results of this study, conducted in a comparatively small cohort with a relatively short follow-up period, supported previous findings that LLLT may be a promising tool for the management of TMD, especially when combined with physiotherapy, as it was found to be effective for treatment of TMD symptoms, tenderness to palpation, as well as improving jaw functional behavior. These results emphasize the need to conduct a longitudinal study with a larger sample size and longer follow-up period in order to support the use of this promising combined modality of treatment. The tertiary hospital (PSMMC) where this pilot study was conducted proved to have a good flow of TMD patients, hence, recruitment of more patients should not be a problem. Additionally, well-established oral medicine and physiotherapy departments exist and are of appropriate settings for our future planned larger-sample size research.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Alqahtani AM, Almohaya MS, Al Torairi NS, Al Otaibi LM. The efficacy of combining low-level laser therapy with oral motor exercises in patients with temporomandibular disorders (pilot study). Int J Clin Trials 2023;10(4):282-90.