EVALUATION OF THE EFFECT OF GALLIUM-ALUMINUM-ARSENIDE LASER THERAPY ON DRUG-RESISTANCE TEMPOROMANDIBULAR DISORDERS

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Received on 02-07-2016

Abstract

Introduction: Temporomandibular disorder (TMD) is a clinical term used for clinical signs and symptoms that affects the temporomandibular joints, masticatory muscles, and associated structures. It has different etiologic factors such as parafunctional habits, psychological and occlusal factors. Surgical and non-surgical treatments can be used for TMD managements. Non-surgical route is the main part that consists of pharmacological, occlusal and physical therapies. The present study aims to evaluate the effectiveness of Low Level Laser Therapy (LLLT) in treatment of TMD patients who did not respond to pharmacological therapy.

Methods: This clinical trial was conducted on 15 patients underwent LLLT for 8 sessions with diode laser (Ga-Al-As, 980nm, dose 5 j/cm²). Helkimo index and visual analogue scale (VAS) were measured during treatment period and throughout follow-up sessions.

Results: Significant reduction in VAS and Helkimo index was observed in treatment period and VAS reduction in follow-up sessions.

Conclusion: Our findings support the efficacy of LLLT in drug–resistant TMD. It was useful in relieving pain and muscles tenderness.

Key word: Low Level Laser Therapy, Temporomandibular disorder, pain; laser; TMJ.

Introduction: Temporomandibular disorder (TMD) is a clinical term used for clinical signs and symptoms that affects the temporomandibular joints (TMJ), masticatory muscles, and associated structures [1]. Etiologic factors include...
parafonctional habits, psychological and occlusal factors [2,3]. Patients with TMD suffer from orofacial pain, muscle tenderness, joint noises, limited mandibular movements, pain in TMJ, headache, and tinnitus [4,5]. Diagnosis of TMD is based on clinical examination, history, and use of other methods such as a questionnaire (research diagnostic criteria for TMD). Nevertheless, clinical examination is the main part of TMD diagnosis. It consists of measurement of mandibular movements with a digital caliper, palpation of masticatory muscles and TMJ and also the use of stethoscope to assess the joint noises [6]. Surgical and non-surgical treatments can be used for TMD managements. Non-surgical approach is the first and main part that consists of pharmacological therapy such as non-steroidal anti-inflammatory drugs (NSAIDs), antidepressants, and muscle relaxants. The second part includes occlusal and physical therapy such as Low Level Laser Therapy (LLLT), Transcutaneous Electrical Nerve Stimulation (TENS) and ultrasound [7-12]. LLLT is used in different fields of medicine like dermatology and physical therapy [13]. LLLT reduces histamine, PGE2, and substance p in the posterior horn of the spinal cord. It is also elevated level of acetylcholinesterase, lymphatic drainage, adenosine triphosphate and beta endorphin, so it is suggested for chronic and acute pain reduction [14].

Different studies have used LLLT for TMD management. Cinter et al.[15], Shirani et al.[16], and Carvalho et al.[9] used LLLT in TMD patients and reported positive effects especially in pain reduction. In contrast, some studies did not show any significant therapeutic outcomes [17]. We could not find any studies that evaluate LLLT on drug-resistance TMD patients.

Materials and Methods

This clinical trial was conducted on 15 patients with drug-resistant TMD referred to Oral Medicine Department of Shiraz Dental School, Shiraz, Iran. Exclusion criteria were included missing of five or more posterior teeth (except for third molars) and systemic diseases. All patients that used 1000mg Methocarbamol every 8 hrs and 100 mg celecoxib every 12 hrs for 10 days but did not feel better (based on VAS and clinical examination) were enrolled in this study. So patients discontinued their drugs 3 days before starting the new treatment and during the course of study. Helkimo index [18-21] was used for scheduling the patients. In Helkimo index, maximum jaw opening is the distance between the incisors and is measured by caliper (Insize, China). 10 muscles that are palpated in this index including : profound massetter, superficial massetter, posterior part of temporal, anterior part of temporal, insertion of temporal, lateral pterygoid, medial pterygoid, anterior digastric, posterior digastric and sternocleidomastoid muscles[22]. The patients has
been received LLLT for 8 days, during two weeks. Gallium-Aluminum-Arsenide (Ga-Al-As) (Azor-2k-02, 980nm) was used that applied on 3 regions of both sides: posterior and anterior aspect of the joint, and also onto trigger points. Energy intensity was adjusted to 5 j/cm² using the output power of 200 mw for 2.5 min. For pain intensity assessment, visual analogue scale (VAS) was used and recorded in each session. Helkimo index also was used for clinical evaluation of TMD that checked before and after treatment (in the last session). The patients had been followed at the 4, 8, and 16 weeks after treatment using VAS assessments. Data were analyzed with statistical package SPSS (version 18.0, SPSS Inc., IL, USA) on mean ± SD and frequency (%). Paired t-test was used to compare Helkimo index before and after treatment and VAS score at each time point. Repeated measures ANOVA (RM-ANOVA) was used to assess the changes in pain scores (VAS) overtimes. The P values less than 0.05 were considered significant.

Results

Eleven females and 4 males participated in this study with the mean age of 31.87 years old.

Helkimo index after treatment was significantly decreased (P< 0.001) (Table1).

After 2 sessions of treatment, the VAS score was significantly decreased (Table2).


<table>
<thead>
<tr>
<th>Helkimo Index</th>
<th>Mean</th>
<th>SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>12.20</td>
<td>3.321</td>
<td></td>
</tr>
<tr>
<td>H2</td>
<td>9.07</td>
<td>3.123</td>
<td></td>
</tr>
<tr>
<td>H1 – H2</td>
<td>3.133</td>
<td>1.846</td>
<td>≤0.001</td>
</tr>
</tbody>
</table>

Table 2: Comparisons of VAS score after the first session LLLT treatment and at follow-up sessions.

<table>
<thead>
<tr>
<th>VAS Time</th>
<th>Time (week)</th>
<th>P.Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>0.232</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.007</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>0.011</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>0.134</td>
</tr>
</tbody>
</table>
Discussion

TMD is one of the most important problems. A large portion of population experienced it. Parafunctional habit, malocclusion, psychologic problems can lead to the development of TMD[23-25]

In this study we evaluated the effect of LLLT method on patients who did not respond to pharmacological treatments. To the best of our knowledge, there was not found any similar study that evaluated drug -resistance TMD patients. In this study, during the periods of treatments the patients did not use anti-inflammatory drugs, so we only observed the pain reduction effect of LLLT but only some trials prohibited co-intervention by anti-inflammatory drugs[26]. Selection of this group of patient also eliminated the analgesic and muscle spasm effect of medicine.

Patients received 8 treatment sessions. Otherwise, the majority of trials involved treatment for more sessions [8,9,27,28]. It is rational that shorter periods of treatment with desirable effect increase the cooperation of patients and is more applicable clinically.

Regarding the age and sex prevalence of TMD among patients, our results were also consistent with those of previous studies: it’s more prevalent in the age of 20-40 and in females.[29,30]

In the present study, Helkimo index and VAS were measured, but in most studies only VAS or jaw movements were measured [8,16,19,31]. Helkimo index evaluated the jaw movements, muscle tenderness and TMJ sounds. Therefore, it was a complete index and involved many criteria. In addition, results of Kulekcioglu study showed that pain (subjective criterion) reduced in both placebo and laser group in TMD but mouth opening (objective criterion) only improved in laser group[30].

So in this study we evaluated both objective (Helkimo index) and subjective (VAS) parameters to rule out psychological effect of treatments.

The VAS score was decreased in the LLLT group during treatment similar to other studies [9,15,16], but differ from other studies that reported no significant positive effect[7,17].

In the follow-up sessions VAS was significantly decreased until 8 weeks, similar study followed patients for 3 weeks and showed this result [26].

Replication of these findings in a randomized placebo controlled clinical trial with larger sample surely shows more reliable results. Furthermore, longer follow-up sessions better for evaluating the persistent of the pain reduction.
Conclusion

The results of our study have shown that the use of LLLT was effective in drug-resistance TMD patients, so LLLT can be used as adjuvant therapy.

References


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