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CLINICO-STATISTICAL ANALYSIS OF THE EFFECT OF GAAIAS LASER TREATMENT ON TEMPORO- MANDIBULAR AND MYOFASCIAL PAIN DISORDERS*

Maya Zhelyazkova, Savina Nencheva-Svechtarova, Vassil Svechtarov

The tested GaAIAs (870 nm) and superluminescent red light (660 nm)/MedX 1100 phototherapy device demonstrated positive results regarding the relief of painful symptoms in patients with chronic temporomandibular and myofascial complaints. A significant reduction ($p < 0.05$) in the pain level was observed in the temporomandibular joint and in the masseter muscles using paired samples t-test and Wilcoxon signed rank test.

1. Introduction

The most often used low-level laser is the GaAIAs, operating in the 780–870 nm diapason. The penetration depth of its wavelength is 2–3 to 5 cm, and is used for the treatment of structures like muscles, tendons and joints. Superluminescent diodes (SLD) or light-emitting diodes (LED) are also used, but their penetration depth is less than 1 cm. SLD diodes compared to LED are more powerful and the light can reach a depth of 2.5 cm.

The publications regarding the application of infrared GaAIAs laser and the red light for the treatment of patients with temporomandibular disorders and myofascial pain syndrome are not sufficient. Additional randomized clinical research regarding the treatment effect, wavelength and application methods is

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needed. Maia ML et al.[4] gives an extensive review on the subject. The paper summarizes fourteen studies on the use of low level laser therapy for treatment of Temporomandibular disorders (TMD) from which thirteen show a reduction in pain levels. In nine of them the reduction of pain is registered only in the experimental group, while for the remaining four the effect is observed in both the experimental and the placebo group. However, these studies used different parameters and calibration techniques thus further analysis is needed for conclusions. Cafaro et al. [1] study the clinical effectiveness of low level laser therapy (LLLT) for the management of oral lichen planus. The variables of interest are the size of lesions, the visual analogue score of pain and the stability of the therapeutic results in the follow-up period. Significant reduction in clinical scores of the treated lesions and in the reported pain is found. No side effects were observed. The purpose of the study of Venezian et al. [5] was to evaluate the effect of diode laser on pain to palpation and electromyographic (EMG) activity of the masseter and anterior temporalis muscles. The authors show that only the active doses cause statistically significant reductions in pain level in all the regions of the explored muscles. Still, there was no significant statistical difference between experimental and placebo groups, although the treatment decreased the pain symptoms in the experimental groups. Carrasco et al. [2] applied GaAIAS (780 nm) laser to patients with myofascial pain syndrome that were divided to six groups (first three groups received GaAIAs laser treatment, while group four to six received placebo applications) and found a significant pain reduction. Fikachkova et al.[3] treated 61 patients with temporomandibular dysfunction and myofascial pain with 10 doses of 10J/cm² and 15J/cm² using GaAIAs laser with power of 400mW, 830nm wavelength. The application was in the painful myofascial trigger points area. The results showed that the laser therapy is very effective in the treatment of chronic TMD.

2. Data

The study includes 45 patients, aging from 17 to 70, in the department of Oral and Maxillofacial Surgery of the Faculty of Dental Medicine in Sofia for the period between 2010 and 2013. All the patients had clinical symptoms of chronic joint and/or myofascial pain caused by different etiological factors. Chronic myofascial pain is defined as a painful condition existing for at least three months. Data is collected based on palpation pain in the joint, masticating muscles, regional orofacial structures, and pain in the cervical (sternocleidomastoideus and trapezius) muscles.

The Diagnosis and Classification of the disease is done using Standardized

Axis 1 of RDC/TMD (Research Diagnosis Criteria for Tempomandibular Disorders last version from 2010 year), which includes questionnaire about history of the disease and methods for clinical examination.

Flat and volumetric palpation of chewing and cervical muscles is used for localization of the myogenic trigger points as well as palpation of the joints. The data for pain localization and its intensity was recorded for each individual. The intensity of the pain is measured from 0 to 10 on a scale by National Institute of Health. The data file analysed includes pain intensity of the mandibular joint - uni and bilaterally, temporal muscles, masseters, medial pterygoids, posterior digastrics, lateral pterygoids, sternocleidomastoideus, trapezius. All measurements are taken before and after completing the laser therapy - after six procedures. The aim of the study is to do a clinical-statistical survey to find if there is reduction of the intensity of the pain after treatment with GaAIAs laser (870nm) and superluminescent diod red light (660 nm) Med X/1000 photo therapy device on patients with chronical temporomandibular and myofascial disorders.

3. Methods

The frequency of the laser treatments is 3 times per week for 2-3 weeks or until there is a reduction in the pain and overcoming of the dysfunction. That is the reason why we took pain data after 6 doses of treatment for our analysis.

We used both paired t-test and the corresponding nonparametric Wilcoxon signed rank test [5]. The difference in pain (before and after therapy) is the variable of interest. The null hypothesis is that the difference is equal to zero. For the paired t-test we use the paired samples for each patient before and after the laser therapy.

4. Statistical and Clinical Results

The percent of women in the study was 84%. The mean age was 42,16 (the standard deviation was 14,209). SPSS statistical software was utilized.

The results from the paired t-test are summarized in Table 1, while for the nonparametric test are summarized in Table 2.

Table 1: Paired t-test results

organ	t-statistic	p-value
Temporomandibular joint unilateral	3,110	0,005
Temporalis unilateral	1.000	0.326
Masseter unilateral	3.211	0.03
Medial pterygoid,posterior digastric, unilateral	1.000	0.326
Lateral pterygoid, unilateral	1.000	0.326
Sternocleidomastoideus, unilateral	1.788	0.84
Trapezius, unilateral	missing	missing
Temporomandibular joint bilateral	5.707	0.000
Temporalis bilateral	missing	missing
Masseter bilateral	3.067	0.005
Medial pterygoid,posterior digastric, bilateral	1.000	0.326
Lateral pterygoid, bilateral	1.000	0.326
Sternocleidomastoideus, bilateral	1.000	0.326
Trapezius, bilateral	1.000	0.326

Table 2: Wilcoxon signed rank test

organ	result
Temporomandibular joint unilateral	rejeant H_0
Temporalis unilateral	retain H_0
Masseter unilateral	reject H_0
Medial pterygoid,posterior digastric, unilateral	retain H_0
Lateral pterygoid, unilateral	retain H_0
Sternocleidomastoideus, unilateral	retain H_0
Trapezius, unilateral	retain H_0
Temporomandibular joint bilateral	reject H_0
Temporalis bilateral	retain H_0
Masseter bilateral	reject H_0
Medial pterygoid,posterior digastric, bilateral	retain H_0
Lateral pterygoid, bilateral	retain H_0
Sternocleidomastoideus, bilateral	retain H_0
Trapezius, bilateral	retain H_0

5. Conclusions

The results (Tables 1 and 2) show that there is a statistically significant reduction of the pain in the temporomandibular joint and in the masseter (both uni and bilaterally). The results of the paired t-test are similar with the results from the nonparametric test. They show that the phototherapy is very effective in the reduction of myofascial pain. There are however areas for which we do not observe statistical significance, e.g. temporalis, medial and lateral pterygoid, sternocleidomastoideus and trapezius. A goal of future research is to find a biological reason why the GaAIAs laser treatment has statistically significant reduction of pain for some of the organs and also to compare our results with similar studies in the literature.

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