

The low- level laser therapy in temporo-mandibular disorders-an update of the current literature

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Abstract

Temporo-mandibular disorders (TMD) have become a frequently encountered pathology. Its complexity requires a higher degree of knowledge in matters of diagnosis and treatment. Although the diagnosis aspect has a golden standard represented by magnetic resonance imaging (MRI), the treatment part is not completely understood. Low-level laser therapy (LLLT) has been used as one of the tools to treat TMD for more than ten years now. The aim of this study is to evaluate the scientifically based evidence on the efficacy of low-level laser therapy in the treatment of TMD.

Material and methods: An electronically search of the PubMed and Science Direct data bases has been performed starting from 2008 and up to June 2018. Selection criteria included: human subjects, articles written in English, review type articles.

Results: After a careful review of the aforementioned databases, we have included in this present update a number of 10 articles.

Conclusion: The association between TMD and LLLT seems to bring about an improvement of the symptoms related to this pathology. Although the results in reducing pain and improving oral function are encouraging, the heterogeneous laser parameters used in therapy and lack of standardization does not allow the elaboration of a certain clinical guideline. Further research is recommended to establish an evidenced-based protocol.

Key words: low-level laser therapy, temporomandibular disorders, review

Introduction

Temporo-mandibular joint (TMJ) pathology is considered to be very complex. The clinical signs and symptoms of the cervical structures, TMJ, masticatory muscles and even the surrounding structures (teeth, periodontium) have been reunited under the name of temporomandibular disorder [1]. More than one classification of the TMD can be found in the current literature in the field. Jeffrey Okeson has established a comprehensive taxonomy [1], but the most commonly used have been elaborated by the American Academy of Orofacial Pain (AAOP) [2] and the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) [3]. They include disc displacements, inflammatory, non-inflammatory, and congenital diseases, and fractures or anchyloses.

The etiopathogenesis of the temporomandibular disorders is controversial. Many theories have been proposed over the years to determine their causes such as: the traumatic, biomechanical, occlusal, joint hyper mobility, microbiological or hormonal theory [4, 5, 6, 7, 8]. As a result, a multidisciplinary approach in the treatment of the TMD has been developed: manual therapy, occlusal splint therapy, electrotherapy, ultrasound, transcutaneous electrical nerve stimulation (TENS) or laser therapy [9,22].

Low-level laser therapy (LLLT) has drawn the attention due to its easy application, short treatment visit and few contraindications. Its effectiveness is still under evaluation and the results are controversial. In the present study, we have applied meta-analysis in reviewing the scientific articles published in journals during the last 10 years with the view to provide some clinical practice guidelines.

Methods

1. Search strategy and selection criteria

We performed an electronical search of the Pubmed and Science Direct data bases starting from January 2008 and up to June 2018. Before initiating our search, careful attention was paid to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement guidelines [10,11,12]. We included the following search terms: “temporomandibular disorder(s)” OR “TMD” OR “temporomandibular joint disorder” OR “TMJ disorder” OR “TM disorder” AND “low-level laser therapy” OR “LLLT” OR “laser therapy” OR “diode laser”.

The inclusion criteria were as follows: randomized clinical trials involving patients with TMD, articles written in English, meta-analysis studies in which LLLT was the treatment option for TMD. The exclusion criteria were: studies performed on patients

with systemic diseases or pain not related to TMJ, abstracts that did not report data on the results of interests.

2. Study selection and data extraction

All the authors involved in the present study performed a screening of the possible relevant titles and abstracts. Next, full-text articles were obtained from the journals taken into consideration. Data extracted from the included studies contained: general information about the publication (year, author), number of patients taken into consideration, treatment-related information (type of laser used and its characteristics, duration, number of meetings) and clinical outcomes.

Results

Focus questions

1. What are the indications of LLLT in TMJ pathology?

Low level laser therapy has been used for more than 20 years in various cases of acute or chronic muscles or skeletal pathologies due to its biostimulative, regenerative, analgesic or anti-inflammatory effect [13]. When it comes to the use of LLLT in TMJ pathology, the literature is controversial, meaning that some authors have obtained no differences between the control the placebo group, whereas others have declared relevant statistic differences in favor of the LLLT [21,23,24].

The clinical indications for use of LLLT in the treatment of TMD might be the following: presence of pain, joint sounds, alterations of jaw movements and muscle tenderness. [14]

2. What are the disadvantages or side effects of LLLT?

None of the articles studied up to now mentions any side effects of the LLLT. The intensity of the laser used in maxillofacial areas does not harm the tissues, but can cause biochemical effects on the cells [15]. The team lead by Da Chunha indicated that a low-level laser could penetrate tendons or the joint capsule, decrease the prostaglandin (PGE2) level in vivo, and cause inflammation [16]. Venancio and his fellow researchers came to the conclusion that LLLT could increase the discharge of urine glucocorticoid, a synthetic inhibitor of endorphin, to generate an analgesic effect [17].

3. What is the most appropriate or accurate working protocol for the LLLT?

When it comes to the question of the correct laser parameters to be used in TMD therapy, an interesting selection of the literature was made by Maia ML et al. They established that in the laser application protocol the energy density ranged from 0.9 to 105 J/cm², while the power density, from 9.8 to 500 mW. The number of sessions varied from 1 to 20 and the application frequency ranged from daily for 10 days to 1 time per week for 4 weeks [18].

4. What are the results of the LLLT use?

A careful selection of the literature was made by Chen et al, its value being assessed by the modified Jadad scale. They evaluated only articles that presented LLLT and placebo groups with a higher degree of inclusion criteria and well-established parameters. In terms of pain relief, using the visual analogue scale, 10 out of the 14 studies taken into consideration proved no significant difference between the two groups. The function of the TMJ was also taken into consideration in terms of maximum active vertical opening (MAVO), maximum passive vertical opening (MPVO), protrusion excursion (PE), right and left lateral excursion (RE and LE), measured in millimeters. In terms of function, LLLT proved to be effective in two of five studies, except for lateral excursion movements [19].

A review conducted by Xu GZ carefully selected 31 articles that proved a positive effect on pain in two thirds of the discussed cases. On the whole, in all the cases taken into consideration, the use of LLLT led to various degrees of improvement of pain and oral function in TMD when compared to the placebo group. In nine of the 31 studies, the authors stated that no side effects of the LLLT therapy were noticed [9]. The other few more articles [20] also taken into consideration are listed in the following table 1.

Conclusion

The current literature offers the clinician a wide range of results concerning treatment options of the TMD. LLLT is considered to be safe and easy to use. The heterogeneous laser parameters found in the scientific data bases do not allow the elaboration of a certain practical guideline. Although the results of using LLLT to reduce pain in cases of TMD are encouraging, a consensus is yet to be reached.

Conflicts of Interest

The authors declare that they have no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Table 1: General information about the studies included in this article

Author / year	Evaluated Studies	LLLT effect on pain	LLLT effect on function	Inconclusive results or no effect of the LLLT
Chen et al, 2014	14	10 studies reported no significant difference in pain relief between the two groups	5 studies reported an improvement of the MAVO, 2 studies of the MPVO and of the PE	
Xu GZ et al, 2018	31	17 studies reported positive effect in reducing pain	3 studies reported positive effect on masticatory efficiency	10 studies
Maia ML et al, 2012	14	13 reported pain relief	not evaluated	4 studies reported pain relief in both experimental and placebo group
Petrucci A et al, 2011	6	not significantly different from the placebo group	positive effects on maximum vertical opening	

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