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Effectiveness of Manual Therapy in Treating Myofascial Pain Related to Temporomandibular Dysfunction: Systematic Literature Review

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Abstract*—*To evaluate the effectiveness of manual therapy in the treatment of myofascial pain related to temporomandibular disorders (TMD) through a systematic literature review. A systematic electronic search and manual of controlled and randomized clinical trials was carried out. Included articles were published between the years 2004 and 2021. Search was conducted in the Cochrane Library, MEDLINE, Web of Science, Scopus, LILACS and Scielo databases. **Results:** were found 145 titles and abstracts in the search, and 10 articles were included. A total of 493 individuals were assessed. 241 received only manual therapy or manual therapy associated with counseling as treatment. The other patients were a control group, patients undergoing other treatment modalities or patients who did not receive any treatment. Manual physical therapy is effective in the treatment of myofascial pain related to TMD. Thus, this treatment modality must be considered as one of the therapies in reducing muscle pain related to TMD.

I. INTRODUCTION

Myofascial pain in the masticatory muscles is the most common form of Temporomandibular Disorder (TMD) mentioned in the literature. This dysfunction, according to Guarda-Nardini et al, 2012, is responsible for more than half of the cases seen in clinics around the world [(1)]. The treatment is a challenge for clinicians, due to its multifactorial etiology and the extensive amount of therapeutic approaches reported in the literature. Among the most reported therapies for myofascial pain, are physical therapy or manual therapy, muscle relaxants, occlusal devices, counseling and behavioral therapies, acupuncture and botulinum toxin injections [(2)].

In view of so many treatment options, conservative and non-invasive ones are generally recommended for the initial treatment of TMD, as they are effective in reducing painful symptoms and giving comfort to the patient [(3, 4)]. Thus, manual physical therapy is addressed in the literature as a viable therapeutic option and capable of restoring function under normal conditions [(5)].

Manual physical therapy is a therapeutic modality within the field of physical physiotherapy, commonly used to treat, for example, painful symptoms in the spinal joints, and can also be used in the treatment of TMD. Thus, for the treatment of this condition, manual therapy includes mobilization of the TMJ, soft tissues of sore muscles, passive or active stretching exercises and gentle isometric tension against resistance exercises and guided opening and closing of mandibular movements [(6)].

Manual therapy has been the subject of many studies in the literature over the years. However, due to the variability and methodological limitations of the studies,

this type of treatment becomes confusing and often with little credibility in the dental environment. This happens due to the recurrent association of this therapy with other types of treatment, absence of a control group and absence of homogeneity in the type of TMD being treated. Consequently, some results become limited and not reproducible for the treatment of myofascial pain, making it difficult to apply this therapeutic modality in the dental clinic.

In view of this scenario, the objective of this study was to evaluate the effectiveness of manual therapy in the treatment of myofascial pain related to temporomandibular disorder through a systematic review of the literature on controlled and randomized clinical trials in order to better target the treatment of patients with this disorder.

II. MATERIALS AND METHODS

This review followed the recommendations of the PRISMA statement (Preferred Reporting Items for Systematic Reviews and Meta-analyzes) [7]. The question that was intended to answer was: "Is manual therapy effective in the treatment of patients with TMJ-related Myofascial Pain?".

A) Eligibility criteria

Controlled and randomized clinical trials that met the following criteria were included in the review:

- Assessment of patients, adolescents, adults and the elderly with a positive diagnosis of myofascial pain using the Research Diagnostic Criteria for TMD questionnaire (RDC / TMD);

- Presence of at least one intervention group in which manual therapy was applied. This aspect includes: mobilization of the TMJ and / or soft tissues of muscles, passive or active stretching exercises, gentle isometric tension against resistance exercises, guided opening and closing of the mandibular movements and massage.

- Presence of at least one control group, with some other type of treatment (home physical therapy, guidance / counseling, photobiomodulation, botulinum toxin and occlusal devices) or, if applicable, no intervention.

- Studies in which patients had headache associated with myofascial pain and patients diagnosed with a questionnaire other than RDC / TMD were excluded. In addition, when patients were diagnosed with myofascial pain associated with pain of neurogenic origin and cases in which there was an association of drugs and physical therapy in the test group, studies were excluded.

Table 1: Exclusion criteria and articles excluded after reading in full.

Chart 2 - Exclusion criteria and articles excluded after reading in full.

Did not use RDC / TMD for diagnosis (10)
Greene CS, Laskin DM, 1974
Kraaijenga S, et. al., 2014
Nicolakis P, et. al., 2002
Oliveira-Campelo NM, et. Al., 2010
Bae Y, Park Y, 2013
De Paula Gomes CAF, et. al., 2014.
Maluf SA, et. al., 2010
Talaat AM, et. al., 1986
Grace, et. al., 2002
Magnusson, et. al., 1999
Study written in a language other than English, Portuguese and Spanish (2)
van der Glas HW, et. al., 2000
Michelotti, et. al., 2000
Associates manual therapy with the use of medicines (2)
Carlson CR, et. al., 2001
Mulet, et. al., 2007

B) Search strategies

The electronic search strategies were conducted by three researchers (CSG, DCO, MPSN) in isolation during the period from March to July 2020, in the databases: Cochrane Library, MEDLINE, Web of Science, Scopus, Pubmed, LILACS and Scielo, using the following descriptors and / or words: Temporomandibular Joint Disorders "," Craniomandibular Disorders "," Myofascial Pain Syndromes "," Myofascial Pain "," Exercise Therapy "," Myofunctional Therapy "," Physical Therapy Modalities "," Clinical Trial ", "Prospective Studies" and "Longitudinal Studies." The strategy using these descriptors was adequate for each type of database (Table 1). In addition to the electronic search, references to original articles, potential systematic reviews and controlled clinical trials were checked.

C) Selection of studies and data collection

After searching the databases, the titles and abstracts were organized in a standardized form. Then, the three researchers, using the same eligibility criteria, made the selection of those studies with the potential to be read in full and included in the review.

The data from the studies read in full and included in the review were noted on a data extraction sheet by the three researchers individually (CSG, DCO, MPSN) and checked to verify the agreement of the findings for each study (sample, country where the study was conducted, age and sex distribution of patients). In addition, the diagnosis, intervention and details of the control, follow-up group and their results were also extracted.

In the presence of disagreements, the authors consulted a fourth researcher and, through consensus, reached a common decision.

D) Bias risk assessment

The "A Cochrane Risk of Bias Tool - ACROBAT" [8, 9] is a tool that assesses six sources of biases: sequential generation, concealment of allocation, masking of participants, personnel and outcome assessors; incomplete data, selective results reporting and other potential sources of bias. It was used in order to assess the quality of the studies included in the review, classifying them in studies with "low risk of bias", "confused risk of bias" and "high risk of bias".

III. RESULTS

The electronic and manual search strategy used resulted in 145 titles and abstracts. Of these, 27 were selected from the inclusion and exclusion criteria and read in full. At the end, 10 were elected to be included in the review (Figure 1 and Table 2).

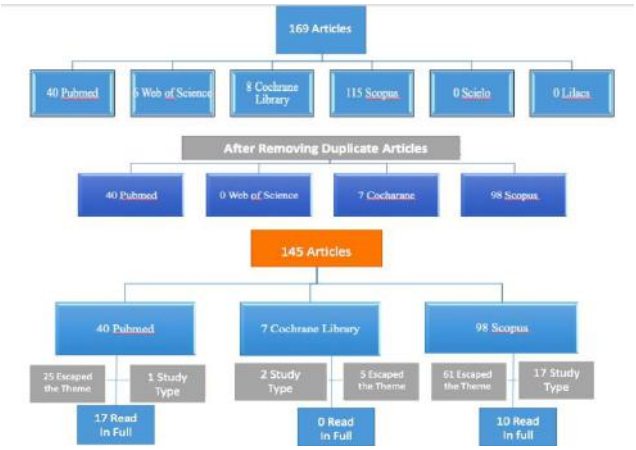

Fig.1: Study Flowchart

Table 2. Risk of bias in articles selected for systematic review.

Study	Generation of the random sequence	Allocation concealment	Blinding of participants and professionals	Blinding of outcome evaluators	Incomplete outcomes	Report of selective outcome	Other sources of bias	Study classification
De Laat et al[4]	Uncertain	Uncertain	Low	Low	Low	Low	Low	Uncertain
Michelotti et al[5]	Uncertain	Uncertain	Low	Low	Low	Low	Low	Uncertain
Kalamir et al[10]	Low	Low	Low	Low	Low	Low	Low	Low
Kalamir et al[11]	Low	Low	Low	Low	Low	Low	Low	Low
Wahlund et al[12]	Low	Low	Low	Low	Low	Low	Low	Low
Guarda-Nardini et al[1]	Low	Low	Low	Low	Low	Low	Low	Low
Tuncer et al[6]	Low	Uncertain	Uncertain	Uncertain	Low	Low	Low	Uncertain
Brochado et al	Uncertain	Low	Low	Low	Low	Low	Uncertain	Baixo
Calixtre et al	Low	Low	Low	Low	Low	Low	Low	Uncertain
Nagata et al	Low	Low	Low	Uncertain	Low	Low	Uncertain	Baixo

High - Indicates a high risk of bias, which weakens confidence in the results of the articles; Low - Indicative of low risk of bias, which is unlikely to compromise the results of the articles; Uncertain - Presence of biases that raise doubts about the results of the articles.

In the selected studies a total of 493 individuals were assessed, with ages ranging from 12 to 69 years. Of these participants, 148 received only manual therapy and 93 received manual therapy associated with counseling. The other 252 individuals corresponded to the control group, 15 of whom were treated with botulinum toxin injections, 50 with home physical therapy alone, 31 with manual therapy and home physical therapy, 18 with photobiomodulation, 17 with photobiomodulation and manual therapy, 31 without any treatment, 57 with advice only and 33 with occlusal plates.

In general, studies have assessed differences in reporting myofascial pain intensity and mouth opening amplitude. De Laat et al[4] carried out a randomized

clinical trial, evaluating the effectiveness of manual therapies in reducing myofascial pain and mandibular function. All research participants received counseling related to relaxation and use of the jaw. They were divided into two groups, in which Group I (n = 13) received 4 weeks of physiotherapy and Group II (n = 13) 6 weeks of treatment. Manual therapy resulted in significant improvements after treatment in pain parameters (p <0.001) for both groups, reaching an average of 60% of pain reports. There were no statistically significant differences between the groups that received 4 or 6 weeks of physical therapy.

Michelotti et al[5] conducted a randomized clinical trial, which compared the effectiveness of educational counseling and manual therapies associated with counseling in the treatment of myofascial pain. In the group that received only educational counseling (n = 34), the success rate in reducing pain was 57%, while the group that received manual therapies associated with counseling (n = 36) obtained a rate of 77%. Although the results were numerically better for the association of education with home physiotherapy, this difference was not statistically significant (p = 0.157).

One of the reasons that may explain this result is the possibility that the patients did not perform the home physiotherapy exercises in the correct way as they were instructed, which may have compromised the evolution of the condition.

Kalamir et al[10] evaluated whether there were differences in the results of the treatment of myofascial pain when comparing individuals who received supervised manual therapies in isolation (n = 31), manual therapies associated with counseling (n = 31) and non-treatment, as a control, (n = 31). For this, a randomized clinical trial was carried out. They observed statistically significant differences (p <0.05) in pain reduction in both groups that received interventions compared to controls at 6 months and 1 year of treatment. There were also significant differences (p = 0.016) between the two groups that received treatment in 1 year, with greater pain reduction in the group that received manual therapies associated with counseling compared to the group that received only manual therapies alone.

Another randomized clinical trial also carried out by Kalamir et al[11], assessed the differences between supervised manual therapies and short-term counseling on myofascial pain. Individuals who received manual therapies (n = 23) obtained statistically better results (p <0.001) in reducing myofascial pain when compared to the group that received only counseling (n = 23).

Wahlund et al [12] conducted a randomized clinical trial in 64 adolescents. This study compared the effectiveness of a group that performed manual therapies, through supervised relaxation training (n = 31) with another group, treated with occlusal splint, (n = 33) in reducing myofascial pain. When comparing the groups, a statistically significant difference (p <0.001) was observed in the reduction of myofascial pain in the group treated with splint. A 62.1% success rate in reducing myofascial pain was observed in the group treated with occlusal splint, while in the group treated with supervised relaxation there was only a 17.9% reduction during Phase 1 of the study. This discrepancy was also observed in Phase 2 of the study. To conclude, in the 6-month follow-up, around 2/3 of the participants reported improvement in their pain. The article reports that there was a slightly higher motivation and longer treatment time in the group treated with occlusal splint. The lower adherence of adolescents to the supervised relaxation group can be explained by the fact that it requires greater commitment on the part of the patient in the daily routine.

In the study by Brochado et al [13], a randomized clinical trial was compared to the efficacy of photobiomodulation (n = 18) with manual therapy (n = 16) or treatment using the two devices (n = 17) in 51 patients. They concluded that both photobiomodulation and manual therapy were effective in reducing pain (P <0.001), improving mandibular function (P <0.001). The treatment with photobiomodulation and photobiomodulation associated with manual therapy reduced the depressive symptoms of the patients. However, the combined treatment of the two therapies together did not perform better than the therapies individually on the analyzed variables.

Calixtre et al [14] in their clinical trial performed only manual therapy in 12 patients for 9 weeks. The protocol was always performed by the same professional, in 35-minute sections, twice a week for 5 weeks. The sections consisted of 20 minutes of manual therapy, followed by 10 minutes of muscle conditioning and 5 minutes of stretching, a protocol established by La Touche et al (2009). As a result, this study noted that there was an improvement in mandibular function (P = 0.019). Self-reported pain was significantly reduced (P = 0.009). The maximum painless opening range increased from an average of 32.3 mm to 38 mm. There was also an increase in the pain-pressure threshold in the masseter and temporal muscles on both sides (P> 0.05). Despite the good results, the clinical relevance of the study is questionable.

Nagata et al [15] evaluated in their randomized clinical trial patients undergoing treatment with manual therapy + home physical therapy (n = 31) with patients who

underwent only home physical therapy (n = 30). In addition, all patients in the research received counseling guidance regarding the control of tightness in wakefulness, diet and posture. Home physical therapy was stretching exercises and manual therapy was performed by a trained professional. There was an improvement in all parameters evaluated (limitation of opening, orofacial pain and joint noise) in both treatment groups. The group that combined manual therapy with home physical therapy showed a better performance than the group that performed only home physical therapy in the variable limitation of mouth opening and TMJ noise. However, this difference was not statistically relevant (P> 0.05).

Guarda-Nardini et al [1] compared the effectiveness of manual therapy in several sections with a single injection of botulinum toxin in the masseter and temporal muscles in reducing myofascial pain. In their results, they found that both treatments improved pain levels, with facial manipulation slightly higher in reducing the perception of subjective pain and applying botulinum toxin slightly higher in increasing mandibular range of motion. However, this difference was not statistically significant (p> 0.05).

Finally, Tuncer et al [6] evaluated the effectiveness of manual therapy and compared it with physical therapy at home in patients with muscle TMD. These patients were divided into 2 groups. The first group (n = 20) received detailed guidance on the etiology of pain, ergonomics, breathing exercises, relaxation techniques, postural correction exercises, mandibular exercise, repetitive stretching, opening and closing exercises and resistance exercises. The other group (n = 20), in addition to these guidelines, patients received manual therapy performed by a specialist. In their results, the effectiveness of the treatment used in the group that received the guidelines and manual therapy was significantly greater for pain, both at rest and in stress, when compared to the group that received only the guidelines (p <0.001).

IV. DISCUSSION

This study looked at the scientific evidence to assess the effectiveness of manual therapy in the treatment of myofascial pain related to TMD. For that, only controlled and randomized clinical trials were included, with a high level of scientific evidence. The studies included in this review were standardized by the use of RDC / TMD in order to guarantee the validity, similarity and reproducibility of the studies, as well as to avoid the confusing result with the diagnosis of joint pain. Despite this, it was not possible to perform a meta-analysis of the articles, since the studies were considerably heterogeneous methodologically and manual therapy was compared with different interventions (physical therapy, guidance / counseling, botulinum toxin, photobiomodulation, occlusal devices or without intervention).

It was possible to observe, after the search strategies, a low number of randomized controlled clinical trials that evaluated the effectiveness of manual therapy in the treatment of myofascial pain related to TMD. This fact demonstrates that studies are still needed to have sufficient scientific evidence in the literature to support the effectiveness of this treatment. Associated with this, 4 of the 10 studies included in the review have a dubious methodological quality, since they presented an uncertain risk of bias (Table 2). Therefore, it is necessary to exercise caution when analyzing and inferring the results.

9 studies included several manual therapy techniques applied by a specialized professional and 1 study included home manual therapy techniques. They consisted mainly of self-relaxation exercises with diaphragmatic breathing, self-massage of the masticatory muscles (mainly masseter and temporal), stretching, coordination exercises and intraoral massage techniques. In the works by Kalamir et al [10, 11], Wahlund et al [12], Guarda-Nardini et al [1], Brochado et al [13], Calixtre et al [14], Nagata et al [15], Tuncer et al [6] and De Laat et al [4] the therapy was instituted by a specialist and, in all cases, an effective reduction in pain perception and improvement in mandibular function over time was observed, ensuring better opening levels . The study by Michelotti et al [5], in which the patient was instructed to perform manual home therapy, despite also showing results of improvement in pain and mandibular function, the results are more limited, since home therapies depend a lot of patient education and collaboration in performing the exercises frequently and correctly.

In their study, Tuncer et al [6] compared supervised manual therapy with home therapy, providing patients with very complete instructions, not only on how to perform exercises and frequency, but also on the etiology of pain, postural influence and techniques of breathing and relaxation, which makes us see the importance that a correct and detailed instruction to the patient is an important factor in the success of the treatment.

It is important to consider that when its effectiveness was compared to that of other therapeutic interventions, limitations of this therapeutic technique were found when used alone [5] and reduced scientific evidence of its effectiveness. In the study by Wahlund et al [12], the occlusal splint obtained results superior to those of TM. One of the reasons that can justify this finding is the population studied, who were teenagers, with little

commitment in their efforts during therapy sessions and in the frequency with which they perform home exercises. In addition, it may be possible that TM is less effective in treating TMD in this group. The authors suggested increasing therapeutic support and the number of therapy sessions in this group of patients [12]. However, a more in-depth discussion is limited by the reduced amount of work in this field and further studies, which consider a longer treatment interval and / or a greater number of sessions, are necessary.

In this review, it was observed that the effectiveness of manual therapy was closely related to counseling techniques. Its effectiveness was superior when these two types of treatment were associated [6, 11]. In some cases, no difference was found between the effectiveness of the two [5]. This highlights the importance of talking and guiding the patient during the treatment of myofascial pain. Thus, patient education and collaboration plays an important role in improving symptoms. In addition, the increased responsibility of the patient in addressing the psychosocial factors of the disease can be an important tool during treatment [15]. However, there is still no clear evidence on the effectiveness of one treatment over the other for the control of myofascial pain, since studies report divergent data, in which TM is superior to counseling [10] or not [5].

V. CONCLUSION

In conclusion, despite the low scientific evidence, most studies have shown that manual physical therapy associated with educational counseling was more effective in treating myofascial pain related to TMD. Thus, since it is a low-cost, non-invasive, and reversible therapy, this treatment modality must be considered as one of the therapies in reducing muscle pain related to TMD.

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