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PHYSIOTHERAPEUTIC REHABILITATIVE APPROACH IN MANDIBULAR CERVICAL SKULL DYSFUNCTION

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Abstract: ***Background:*** *Temporomandibular dysfunctions present a multifactorial etiopathogenesis that require a multidisciplinary approach in which the rehabilitation performed by physiotherapists assumes a role of primary importance. Despite the high number of publications, the studies observed purely in the physiotherapeutic field are in a very low percentage.* ***Methods:*** *To this end, a literature search was conducted on the Pubmed database, using three key words: "Mandibular temporal Joint rehabilitation", "Physical therapy temporomandibular", "Rocabado" and "Physical therapy". The total number of items identified is 1594, of which 40 were deemed relevant to the research through the review process.****Results:****After examining the selected studies, the most effective management of temporal mandibular dysfunctions appears to be the conservative approach that includes non-thrust joint mobilization and HVLA thrust manipulation to the TMJ and / or upper cervical articulations, and dry needling or acupuncture to the lateral pterygoid muscle and posterior periarticular connective tissue.* ***Conclusion:****Through such therapeutic modalities it is possible to have an impact on the anatomical structures directly connected to the etiology of the dysfunction.*

Keywords: *mandibular temporal joint rehabilitation; physical therapy temporomandibular, Rocabado; temporomandibular dysfunction*

Abbreviations:*TMD = temporomandibular dysfunction; HVLA = High-Velocity Low-Amplitude, TMJ = temporomandibular joint, MCSD = Mandibular Cervical Skull Dysfunction.*

INTRODUCTION

The mandibular cervical cranial dysfunction (MCSD) in the international definition constitutes a set of painful and / or dysfunctional inflammatory or degenerative conditions affecting the temporomandibular joints (TMJ), the mandibular musculature and the structures to which they contract anatomical-functional relationships. [1] The origin of mandibular temporal dysfunctions is multifactorial, due to the overlapping of dental malocclusion, biological and psychological phenomena, traumas, predisposing lifestyles [2].

These characteristics require a multidisciplinary approach in which multiple professional figures intervene simultaneously and in this context, the physiotherapist becomes a prominent figure within the team that deals with the management of the patient affected by problems of the temporomandibular district. [3]

Research in literature has not shown any particular scientific evidence in the rehabilitation field such as to validate a therapeutic protocol with respect to others, which takes into consideration the whole multifactorial etiopathogenesis of MCSD. For this reason, a systematic review was carried out, analyzing all the scientific studies published on the Pubmed database concerning rehabilitation in MCSD.

Despite the high number of publications, the studies observed purely in the physiotherapeutic field are in very low percentage and in most cases tend to a non-global approach.

METHODS

The objective of the following review is to evaluate the methods used to rehabilitate the temporomandibular joint. To this end, a literature search was conducted on the Pubmed database, using three keywords:"*Mandibular temporal Joint rehabilitation*", "*Physical therapy temporomandibular*", "*Rocabado*" e "*Physical therapy*".

The total number of items identified is 1594, of which 40 were deemed relevant to the research through the review process. Selecting the keyword "*mandibular temporal Joint rehabilitation*", we find 93 studies concerning the rehabilitation of the temporomandibular joint, but with more careful analysis, only 10 are those that really take into consideration the re-education of the dysfunctions themselves.

With the keywords "*Rocabado*" and "*Physical therapy*", 6 scientific studies are found and selected, where the improvement of the symptomatology is taken into consideration following an evaluation with tests aimed at determining the real involvement of the afferent structures and the treatment through the techniques of postural rehabilitation of the complete temporal mandibular joint.

Finally, with the keyword "*physical therapy temporomandibular*", we arrive at 1495 articles, of which a small number concerned the rehabilitation of the temporomandibular joint through physical exercise, electro-physical therapy, mobilization and manipulation of the joint.

Of the articles found and analyzed, the Impact Factor and the ISSN (International Standard Serial Number) of the magazines were evaluated.

RESULTS

According to Shaffer, Physical Therapy is the preferred conservative approach for the treatment of TMD, [4] as it facilitates multimodal treatment that addresses specific patient impairments [5].

However, management and success require treatment of anatomical structures that are consistent with the disability condition. In this context, the mastication muscles, [6-11], the articular capsule [12-14] and the cervical vertebrae column [15-18] are high-value targets that probably require further consideration in rehabilitative treatment. *Then a further classification of the publications was made regarding the topic dealt with in the temporomandibular rehabilitation:*

1) Rehabilitation with electro-physical therapy (biofeedback / laser / tens / ultrasound / iontophoresis)

Interestingly, in the McNeely study [19] no evidence was found to support the use of any electromedical modalities commonly used by physiotherapists such as biofeedback, laser therapy and TENS to reduce TMD-associated pain.

Because the penetration of ultrasound as a means of depth in a muscle perpendicular to 1 MHz and 3 MHz is 0.9 and 0.3 cm respectively [20], and the intensity of the laser being reduced by 90% in tissues to a depth of 1 cm, [21] very little of the sound waves or energy reaches the TMJ or pterygoids. To the pterygoids and TMJ capsules, the source of the problems according to Scully's model of TMD [22,23], electrophysical modalities are likely to provide very limited relief to patients suffering from TMD.

A series of studies that also considered the use of iontophoresis for TMD treatment reported modest improvements in function but not pain. [24-28]

2) Rehabilitation with joint mobilization

Non-thrust, joint mobilization has been found to improve the extensibility of noncontractile tissue and increase range of motion while decreasing pain and disability via peripheral, spinal and supraspinal mechanisms [29,4]. However, there are currently very few studies that have investigated the use of mobilization, independent of other conservative treatments for TMD. Therefore, after reviewing the systematic reviews, RCTs and clinical guidelines related to the use of mobilization for various musculoskeletal disorders, inconclusive evidence is deduced for the use of joint mobilization for TMDs [30].

3) Rehabilitation with joint manipulation

High-speed, low-amplitude (HVLA) manipulation has been shown to increase mechanoreceptor-related discharges by reducing the activity of the pool of alpha motoneurons in the spinal cord level and subsequently decreases the levels of muscle activation [31].

Several case studies have successfully used HVLA manipulation to treat patients with TMD, reporting decreased pain and disability [32-34].

While Gotou [35] reported significant improvement in condylar movement using JOG-HVLA manipulation (ie combination of a side-to-side pivotal closure and opening by HVLA thrust technique) for the treatment of 34 patients with TMD and opening of the limited mouth (<35 mm). Moreover, in the study carried out by Oliveira-Campelo [36], 121 volunteers were treated with latent trigger points in the masseter and reported that a single session on occipito-atlantoid (C0-1) with manipulation and treatment of soft tissue, muscle release suboccipital led to an immediate increase in the pain threshold in masseter pressure and an improvement in mouth opening compared to control. Taken together, these studies seem to demonstrate a clear connection between the pain in the neck and the trigeminal nerve, highlighting a well-being sensation in particular of the ATM through the temporal auricle branch of the mandibular branch of the trigeminal nerve and the motor innervation of the mastication muscles. [37,38].

While acupuncture specifically facilitates direct contact with the TMJ articular capsule and the superior and inferior heads of the external pterygoid muscle, many of the controlled clinical trials that attempted to treat TMD with acupuncture have reported modest results [19]. In this case, no study has directly investigated the use of needling or acupuncture in improving health in the intra and peri-articular aspects of TMJ in patients with TMD, there is evidence to suggest that acupuncture can be useful for osteoarthritis, mainly due to its ability to stimulate vasodilation and facilitate neovascularization [39-42]. There is limited evidence to support the use of soft tissue release and strengthening exercises for mastication muscles in patients with TMD.

For the reduction of pain due to TMD there is little evidence to support the use of electrophysical therapy and splint therapy.

For the reduction of pain and disability in TMD, non-thrust joint mobilization and HVLA thrust manipulation to the TMJ and/or upper cervical articulations, and dry needling oracupuncture to the lateral pterygoid muscle and posterior periarticular connective tissue may provide the most evidence-based approach for conservatively treating TMD.

4) Rehabilitation according to Mariano Rocabado

Mariano Rocabado’s rehabilitation exercise in patients with internal derangements, included manual joint distraction; disc/condyle mobilization with disc "capture"; extensive exercise therapy, including Rocabado's 6 x 6 x 6 exercise program; and others for the TMJ and cervical/thoracic regions.

Kirk and Calabrese’s study[43] considered a successful treatment if clicks were eliminated and range of motion was unimpeded by abnormal disc dysfunction.

The results show a success rate of 86% was achieved in patients with early- to mid-opening and late- to mid-closing clicks of the temporomandibular joint.

Approximately one third of these patients required short-term occlusal bite appliances to assist in their management. A success rate of 7% was achieved in patients with late opening and late-closing clicks.

Instead no patient with clicking on mediolateral movement was successfully managed with physical therapy. Likewise, patients with non-reducing anteriorly displaced discs of the temporomandibular joint did not respond well to physical therapy.

Rocabado also claims that the application of low-velocity atlanto-occipital mobilization or the soft tissue technique targeted to the suboccipital tissues would lead to an immediate increase in the pain threshold of latent trigger points in the masseter and temporal muscles and an increase in the maximum active mouth opening [44].

Finally, he focuses on how the different cranial-cervical postures influence the values of maximum mouth opening and pain threshold at the pressure of the temporomandibular joint and of the mastication muscles, which receive sensory and motor innervation from the trigeminal nerve.

The results of his studies would seem to provide data that support the very close correlation and the biomechanical relationship between the cranio-cervical region and the temporomandibular articulation dynamics, as well as the trigeminal nociceptive processing in different cranio-cervical postures.

The cranio-mandibular system and the cervical spine must therefore be considered as a single functional entity, and there are now many articles that suggest that patients with temporomandibular dysfunction more often suffer from a cervical spine disorder than people without a TMD. [45,46]

CONCLUSIONS

The literature review indicated a limited use of strengthening exercises for the management of mastication muscles, with the result of limited evidence for the treatment of the soft tissues of the mastication muscles, which may be specifically related to limited accessibility of the pterygoid muscles to palpation. For the reduction of pain, there is little evidence to support manual therapy and therapy with electromedical instruments, including laser, ultrasound, TENS and iontophoresis. However, for the reduction of pain and disability, there are few studies of rehabilitation treatments with high-speed mobilization, low amplitude and direct manipulation techniques on the TMJ and / or upper cervical joints that directly and / or indirectly are a target of ATM and the articular capsule. Some studies have used acupuncture in the lateral and posterior intrarticular pterygoid muscles among other therapies. Treatment of connective tissue has also led to significant improvements in pain and disability in patients with TMD. So the most effective approach from the selected studies is the conservative management of TMD, which seems to be the best technique capable of having an impact on the anatomical structures directly related to the etiology of dysfunction, including the articular capsule, the articular disk and the mastication muscles, in particular the upper and lower abdomen of the external pterygoid.

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