

## Temporomandibular Disorders (TMD) and Their Physiotherapeutic Treatments

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### Abstract

Epidemiological research indicates that half of the people in Brazil experience symptoms of Temporomandibular Dysfunction (TMD) pain. TMD can have a significant impact on individuals, compromising the functional capacity of oral functions, such as facial muscle pain, which leads to limitations in jaw movements and consequently pain in the face, head, and temporomandibular joint (TMJ). In light of this, the present study aimed to provide a more updated understanding of TMD pain and treatment, as well as the resources used by Dentistry and Physiotherapy to address them. The study had an applied and exploratory nature, with a quantitative approach and a bibliographic procedure, consisting of a literature review of scientific articles on the subject. Several studies were found regarding the various types of pain caused by TMD in individuals, however, the number of those seeking appropriate treatment, both in terms of physiotherapy and dentistry, is low. Physiotherapeutic approaches are numerous, with the use of myorelaxant splints, physiotherapy exercises, ultrasound and laser therapy being noteworthy.

**Keywords:** Myorelaxant splint. Laser therapy. Temporomandibular joint.

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### I. INTRODUCCION

Temporomandibular dysfunction (TMD), a condition affecting the temporomandibular joint and associated muscles, presents a significant clinical challenge today. Studies indicate that the prevalence of TMD varies among different populations and age groups.

The complexity of the factors involved, including biomechanical, psychological, and genetic aspects, complicates the therapeutic approach. A multidisciplinary approach that considers not only physical manifestations but also psychosocial aspects is crucial for effective management of this condition (Schiffman *et al.*, 2014).

Temporomandibular dysfunction (TMD) exhibits various factors leading to its onset, being considered of multifactorial etiology, with biopsychosocial risk factors highlighted as one of the main triggers of deleterious symptoms and signs, which can produce masticatory muscle hyperactivity, resulting in myofascial pain (ROCHA *et al.*, 2020).

For Studart & Acioli (2011), it can "have a significant impact on the individual, compromising the functional capacity of oral functions." In this sense, it is essential for patients to seek medical help and for them to be offered the most appropriate treatment, remembering that "the professional-patient relationship can be fundamental for treatment success."

In the current context, TMD has been considered a condition with a significant impact on patients' quality of life and well-being. Some authors have investigated the relationship between TMD and conditions such as migraines, highlighting possible neurobiological connections. Therapeutic approaches, ranging from conservative treatments to surgical interventions, aim to relieve symptoms and improve mandibular function (Gonçalves *et al.*, 2016).

Conditions involving TMD have been recognized as an interdisciplinary challenge in the health field. There is exploration of the relationship between psychosocial factors and the presence of pain and temporomandibular dysfunction. The complex interaction between stress, anxiety, and pain amplifies the need

for holistic therapeutic approaches. Approaches involving cognitive-behavioral therapies and physiotherapy have shown efficacy in managing TMD (LeResche *et al.*, 2011).

TMD remains an active area of research due to its prevalence and complexity. Investigating the relationship between TMD and other disorders, such as sleep disorders, has been an interesting approach. Studies may highlight the association between TMD and sleep quality, underscoring the importance of evaluating multiple aspects in patient management (Santos *et al.*, 2019).

This dysfunction is a multifactorial condition affecting the temporomandibular joint and masticatory muscles, presenting a wide range of symptoms from facial pain to limitations in mandibular function and has been recognized as a significant public health problem due to its prevalence and the impact on patients' quality of life. The complexity of TMD, with associations with factors such as bruxism, psychosocial stress, and incorrect posture (Manfredini *et al.*, 2019).

Therefore, this study sought to update on the pain and treatment of TMDs and the resources used by Dentistry and Physiotherapy to resolve them, thus aiming to conduct a literature review on the symptomatology, etiology, diagnosis, and physiotherapeutic treatment of TMD.

## **II. METHODOLOGY**

The study was applied and exploratory in nature, consisting of a literature review.

For this purpose, the Virtual Health Library (VHL) was used as a research source through databases: PubMed, U.S. National Library of Medicine (NLM), Medline (Online System for Searching and Analyzing Medical Literature), Lilacs (Latin American and Caribbean Literature in Health Sciences), SciELO (Scientific Electronic Library Online), and Google Scholar, without intending to tally the number of articles.

The inclusion criteria were studies found in the period from 2013 to 2023 that addressed the pain and treatments of TMDs and the resources utilized by Dentistry and Physiotherapy. All studies that did not meet the inclusion criteria were excluded.

## **III. RESULTS AND DISCUSSION**

### *Temporomandibular Dysfunction (TMD)*

Exploring the etiology of TMD reveals its multifactorial nature, with biopsychosocial factors being the primary contributors to the pain associated with the disorder, as well as genetic and behavioral factors (Paulino *et al.*, 2018).

According to Cruz *et al.* (2020), since TMD results from anatomical, neuromuscular, psychological, and occlusal factors that can lead to alterations in dysfunction in the head and neck region, TMD may also be associated with stress, emotional trauma, systemic factors, and genetics.

The multifactorial characterization of TMD is a current subject, and studies attempt to assess the role of psychological factors in its onset. Psychological and psychosocial factors are believed to be strongly associated with TMD, including stress disorders and psychiatric illnesses (anxiety and depression) (Lemos *et al.*, 2015a).

Equally important, dental occlusion (the contact between the upper and lower teeth when the mouth closes) has historically been identified as a significant causal factor for TMD.

Occlusal alterations such as "malocclusions, unilateral or bilateral posterior crossbite, tooth loss, and occlusal interferences" have been identified in various studies as predisposing, triggering, or sustaining factors for TMD (Lemos *et al.*, 2015b).

TMD is based on the complex anatomical and physiological interactions of the temporomandibular joint (TMJ). The TMJ is a bilateral joint that connects the jaw to the skull and consists of articular components, such as the mandibular head and the condyle, which move within the articular cavity of the temporal bone.

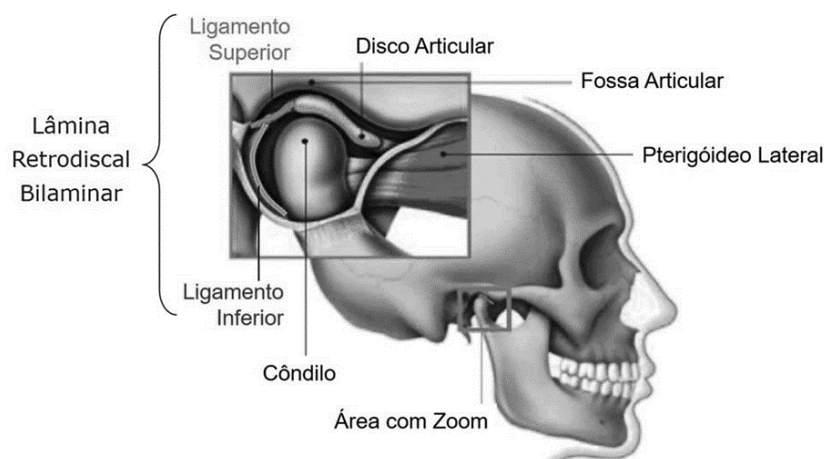
The presence of articular discs and ligamentous structures in the TMJ allows for complex sliding and rotational movements during the opening and closing of the mouth. The integrity and coordination of these components are essential for the proper functioning of the TMJ, and any anatomical alteration or muscular imbalance can predispose to TMD (Okeson, 2008).

Anatomical disorders and misalignments of the TMJ can directly affect mandibular function and contribute to the development of TMD. For instance, displacement of the articular disc can lead to movement restrictions and a sensation of locking during mouth opening or closing.

Additionally, dental misalignment and craniofacial asymmetries can create uneven pressures on the TMJ, causing overload in certain regions and triggering pain and inflammation. The association between the anatomy of the TMJ and the occurrence of TMD is reinforced by studies demonstrating a relationship between morphological characteristics of the mandibular head and the presence of TMD signs (Pullinger *et al.*, 1992).

According to Cruz *et al.* (2020), TMD affects the articular structures of the face, caused by a "neuromuscular disorganization identified by the presence of headaches, sounds in the TMJ (Figure 1), restrictions of mandibular movements, and pain in the mastication muscles."

**Figure 1:** Anatomy of the Temporomandibular Joint (TMJ).



Source: [www.auladeanatomia.com](http://www.auladeanatomia.com)

The adverse effects of TMJ disorders on patient life are linked to pain, which hinders individuals from carrying out many routine actions and from participating in certain social interactions, thereby affecting the overall quality of life (QoL) of individuals (Stuart & Acioli, 2011). Moreover, according to Rota *et al.* (2021), living with this chronic condition can lead to social isolation and questioning of one's physical and mental health.

The harmonious functioning of the TMJ also depends on the proper coordination of the masticatory muscles and the involved neuromuscular systems. Muscles such as the masseter, temporal, and medial pterygoid are essential for mandibular movements. Changes in muscle contraction patterns can result in excessive tensions or imbalances, contributing to TMD, thus highlighting the importance of neuromuscular pathways and sensory systems in controlling mandibular movements and in the perception of pain associated with TMD (Sessle *et al.*, 2008).

#### *Changes in Quality of Life (QoL)*

Quality of life (QoL) is a fundamental aspect to be analyzed when seeking to improve the health of the population. Thus, facial pain caused by temporomandibular dysfunctions (TMD) (Figure 2) becomes a prominent complaint among the majority of patients seeking assistance from dental surgeons, thereby impacting QoL (Kuroiwa *et al.*, 2011).

**Figure 2:** Temporomandibular Joint (TMJ).



Source: [www.bucomaxilofacial.com.br](http://www.bucomaxilofacial.com.br)

TMD transcends the physical realm, broadly affecting individuals' quality of life (QoL), and the chronic pain associated with TMD can lead to significant alterations in daily functionality, interfering with the ability to speak, chew, and even smile, thereby negatively influencing QoL, impacting social and professional activities, and leading to feelings of isolation (Alstergren *et al.*, 2008).

The deterioration of QoL due to TMD can be exacerbated by the presence of emotional symptoms, such as anxiety and depression. Some studies reveal an association between TMD and psychological disorders,

highlighting how physical discomfort can trigger adverse emotional reactions, with the constant concern over pain and functional limitations potentially leading to a cycle of stress and anxiety, negatively impacting individuals' QoL and mental health (Manfredini *et al.*, 2010).

Furthermore, according to Manfredini *et al.* (2011), limitations in mouth opening and pain when speaking or chewing can affect individuals' self-esteem and confidence. Changes in facial aesthetics and concern about the manifestation of symptoms in social situations can lead to a decrease in participation in social and recreational activities, negatively influencing body image and personal perceptions of well-being, emphasizing the need for interventions that address both physical and emotional aspects.

TMD can impact everyday activities, including eating habits and sleep quality. Difficulty in chewing food due to pain and limited mouth opening can lead to the selection of softer foods, affecting nutrition and, consequently, QoL.

Additionally, TMD can contribute to sleep disorders, resulting in tiredness and fatigue during the day. These interconnected effects of TMD demonstrate its influence on the physical, functional, and emotional spheres of the patient (List; Axelsson, and Leijon, 2006).

TMD can extend its effects beyond the individual, also affecting interpersonal relationships. Studies, such as that by Dhima *et al.* (2012), emphasize how the pain and discomfort associated with TMD can impact verbal and non-verbal communication, resulting in relationship difficulties and impaired social interactions. The impairment of facial expression capabilities due to pain and muscle stiffness can hinder the understanding of emotions and effective communication, thus contributing to a decrease in QoL.

Depending on the severity of the triggering factors for TMD-related pain, the negative impacts on the lives of those affected increase, with biopsychosocial factors being largely responsible for the onset of painful episodes.

Therefore, due to the simultaneous use of the oral region for various reasons, the pain caused underpins the hypothesis that this disease has a significant impact on people's quality of life (Stuart & Acioli, 2011).

According to Torres *et al.* (2012), ear pain, facial pain, tinnitus, and especially temporomandibular joint pain are the characteristic signs and symptoms of TMD, which are not considered diseases or necessarily in need of treatment.

These authors also note that "muscular fatigue and spasms may arise from muscular hyperactivity, causing incoordination or dysfunctions of the masticatory muscles, head, and neck muscles."

When it comes to TMD and the pain caused by the dysfunction, the correct diagnosis becomes fundamental for the most appropriate treatment for sufferers.

In this regard, Duarte *et al.* (2019) highlight that "due to the multifactorial characteristic, many therapies are employed, such as counseling, use of occlusal splints, repositioning of the articular disc, pharmacological interventions, and surgery."

#### *Treatments for TMD*

According to Peliccioli *et al.* (2017), the following treatments are indicated for TMD:

- Intraoral and extraoral as well as cervical manual therapy
- Muscular massage
- Passive, active-assisted, and active exercises
- Muscular stretching
- Cervicocranialmandibular postural alignment
- Strengthening exercises for the mandibular, cervical, and scapular regions
- Thermotherapy
- Cryotherapy

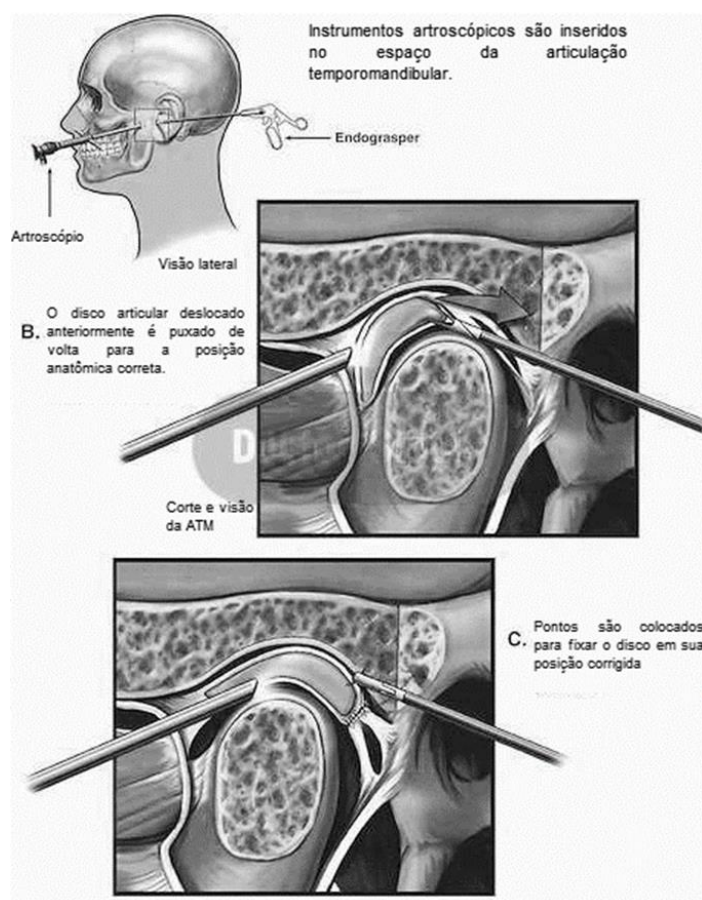
For TMD, treatments include both invasive and non-invasive procedures, such as bite plates, acupuncture, physiotherapy, medication, cognitive-behavioral therapy, surgery, and mucus replacement (De Siqueira, 2014).

Given the nature of TMD signs and symptoms, simple and conservative treatment is preferred over invasive treatment. Active relaxation exercises, stretching, ultrasound, massage, occlusal stabilization, medications, and anesthetic penetration have been shown to have excellent results in pain control when combined with effective dental treatment (Franco *et al.*, 2011).

Studies like that of Guarda-Nardini *et al.* (2012) analyze the outcomes of surgical procedures, emphasizing the importance of a comprehensive and individualized assessment before the decision to undertake surgical intervention.

In more complex cases of TMD, surgical interventions may be considered as a last resort. Surgeries such as arthrocentesis or arthroscopy of the temporomandibular joint aim to correct anatomical abnormalities, remove adhesions, and improve TMJ function (Figure 3).

**Figure 3:** Arthroscopy technique of the TMJ.



**Source:** Adapted from <http://probuco.com.br/tmj-surgery/>

The priority in treating TMD is to alleviate the patient's pain. Subsequent surgery may be necessary, but clinical management is the first step. The goal is to eliminate inflammation in the muscles and joints and improve jaw movement limits (Brazilian Dental Association, 2015).

There is no cure for TMD, but there are several healthy and functional ways to improve the quality of life for patients suffering from this disorder. In these cases, dentists may recommend bite plates, medications, speech therapy exercises, physiotherapy exercises, and acupuncture. Depending on the severity of the case, surgery may be the best solution that a specialist can find (Zahr, 2021).

The treatment of TMD encompasses a variety of clinical and therapeutic approaches aimed at relieving pain, restoring function, and improving patients' quality of life, emphasizing the importance of a multidisciplinary approach, including conservative modalities such as physical therapy, the use of oral appliances, and medications. These interventions aim to reduce TMD symptoms and promote functional recovery (Schiffman *et al.*, 2014).

Cognitive-behavioral therapy (CBT) has emerged as an effective approach for managing TMD, especially when the condition is related to psychosocial factors, where it can help patients understand contributing factors to TMD, identify behavioral patterns, and cope with associated stress. CBT not only alleviates pain but also helps patients develop healthy coping strategies (De Leeuw; Albuquerque and Carlson).

Acupuncture has also gained prominence as an alternative approach in TMD treatment, where the procedure shows gains in reducing pain and improving jaw function in TMD patients. Stimulation of specific points can promote muscle relaxation, increase blood flow, and modulate pain perception, contributing to symptom relief (Tough *et al.*, 2017).

Calixtre *et al.* (2019) emphasize that self-care approaches also play a vital role in TMD treatment. Adopting healthy habits such as stress management, practicing stretching exercises, and using relaxation techniques can complement other therapeutic interventions, highlighting the effectiveness of therapeutic exercise in reducing pain and increasing range of motion in TMD patients, emphasizing the importance of a comprehensive approach that incorporates self-care.

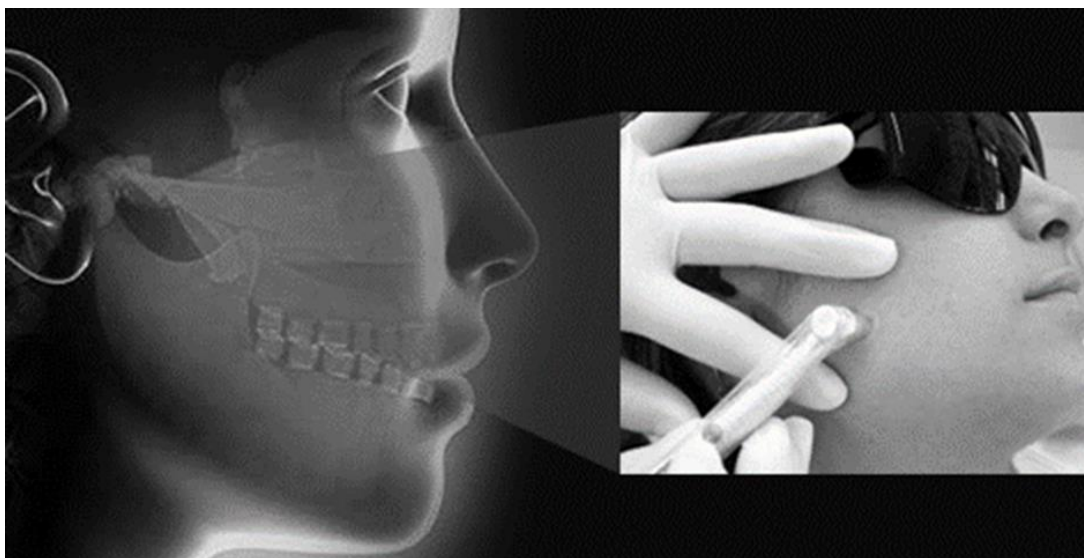
According to De Lacerda *et al.* (2009), the most common pains are odontogenic and located in the TMJ region. Additional damage to the TMJ can identify correctable behavioral factors, such as stress and dietary

management, assessing genetic, environmental, social, and cultural factors involved in the disease relationship, which can be avoided by treatment strategies (Noonan *et al.*, 2012).

Some medical professionals may treat TMD in an interdisciplinary manner. Such follow-ups seek to relieve dysfunction, pain, reduce muscle overload, promote neuromuscular and occlusal balance, and thus reduce stress and anxiety. Surgery as a treatment for this condition is indicated only if conservative measures do not yield positive results (Piozzi, 2020).

Venancio *et al.* (2002) observed that low-level laser therapy (Figure 4) has a proven effect in the symptomatic treatment of pain caused by TMD, generating "a noticeable degree of comfort to the patient after application, and, being non-invasive, the laser offers this advantage".

**Figure 4:** Laser Therapy for TMD Treatment.



**Source:** <http://emiorto.com/dtm/>

Laser therapy has emerged as a promising approach in the treatment of temporomandibular dysfunction (TMD). Through controlled emission of laser light, the therapy aims to alleviate pain, reduce inflammation, and promote tissue regeneration. Studies highlight the analgesic and anti-inflammatory effects of low-level laser therapy, emphasizing its potential in relieving symptoms associated with TMD (Qadri *et al.*, 2014).

The application of laser therapy in TMD can benefit from different types of lasers, including low-intensity and high-power lasers, where tissue stimulation by laser energy can activate repair mechanisms and positively influence local vascularization and circulation (Emshoff; Gassner; Schmidseider, 2018).

It is worth noting that laser therapy can also be combined with other therapeutic approaches to enhance its effects in TMD treatment, where combining laser therapy with rehabilitation exercises demonstrates significant improvements in pain and function in TMD patients.

The synergy between laser tissue stimulation and muscle rehabilitation can offer comprehensive benefits in managing the condition (Venezian *et al.*, 2017).

The safety and non-invasiveness of laser therapy make it an attractive option for patients seeking alternatives to conventional TMD treatments, highlighting the absence of significant adverse effects of low-level laser therapy. Thus, precise application and appropriate selection of laser parameters are crucial to ensuring positive results and minimizing risks (Pinheiro; Aciole; Santos, 2019).

Although laser therapy shows potential in TMD treatment, it is essential to consider the heterogeneity of the condition and the individuality of each patient.

Comprehensive clinical evaluation, including accurate diagnosis and identification of contributing factors, is essential to determine the suitability of laser therapy as part of the treatment plan. Ongoing research, such as that conducted by Pujol *et al.* (2020), is necessary to deepen our understanding of the underlying mechanisms of laser action.

Treatment involving physiotherapeutic procedures lasting 12 weeks and with a frequency of 2 times per week ensure the promotion of "analgesia and control of the inflammatory process, functional rehabilitation, and postural re-education", as well as techniques for rehabilitation of the stomatognathic system and inclusion of TENS (transcutaneous electrical nerve stimulation) (Figure 5) (Pelicioli *et al.*, 2017).



**Figure 5:** Transcutaneous Electrical Nerve Stimulation - TENS.



Source: <https://blog.carcioficial.com.br/uso-do-tens>

The therapeutic approach to TMD often involves considering the stomatognathic system as a whole. This complex system encompasses various structures, including muscles, bones, joints, and nerves related to chewing and speech. There is a need to assess not only the structures directly involved in TMD but also the interactions of the stomatognathic system as a whole for accurate diagnosis and treatment (Suvinen & Reade, 2000).

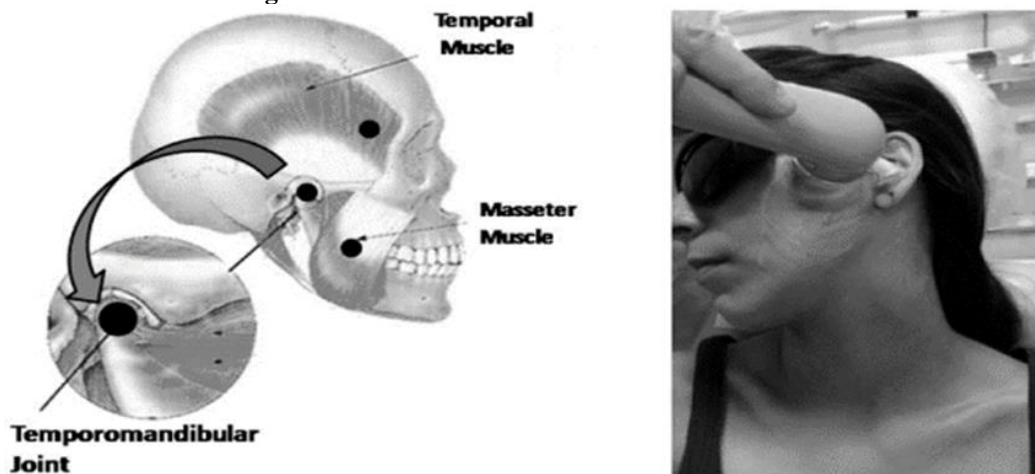
According to Slade *et al.* (2011), the inclusion of Transcutaneous Electrical Nerve Stimulation (TENS) has been considered an effective therapeutic approach for TMD treatment. TENS involves the application of low-intensity electrical currents through the skin, aiming to modulate neural activity and relieve pain. TENS positively affects pain reduction in TMD patients, highlighting its role as a non-invasive and promising option.

The application of TENS in TMD treatment can offer benefits not only in pain relief but also in reducing muscle tension and promoting relaxation. There is a reduction in excessive muscle activity after TENS therapy. It is worth noting that combining TENS with other therapeutic modalities can enhance treatment outcomes for TMD, as a multidisciplinary approach can address both muscular and neurosensory aspects involved in the condition (La Touche *et al.*, 2018). Appropriate doses of ultrasound are used to promote inflammation reduction, increase local blood flow, tissue healing promotion, and pain control (Guerra, 2003). According to Sassi *et al.* (2018), their studies revealed that the results regarding the effectiveness of proposed techniques in the field of physiotherapy such as manual therapy, massage, ultrasound, and the use of robots for laser treatment showed better results and helped reduce facial pain.

The use of ultrasound has been explored as a therapeutic approach for TMD. Ultrasound therapy involves the application of high-frequency sound waves (Figure 6) to promote tissue regeneration, relieve pain, and reduce inflammation. When analyzing the effects of therapeutic ultrasound on improving mandibular function and reducing pain in TMD patients, studies highlight its potential as a non-invasive intervention (Fikáček *et al.*, 2018).

Therapeutic ultrasound can be applied continuously or pulsed, with different intensities and frequencies, depending on treatment goals. Pulsed ultrasound application aids in pain reduction and function improvement in TMD patients. Deep tissue stimulation by ultrasound energy can positively influence healing processes and contribute to symptom reduction (von Piekartz *et al.*, 2019).

**Figure 6:** Ultrasound associated with TMD treatment



Source: <https://jornal.usp.br/ciencias>

Studies like that of Monzani *et al.* (2017) investigate the effects of combining ultrasound with rehabilitation exercises in reducing pain and improving mandibular function in patients with TMD. A multidisciplinary approach can offer comprehensive results, considering both the muscular and structural aspects of the condition.

Research continues to play a crucial role in deepening the understanding of the effects of ultrasound in TMD treatment, demonstrating that the mechanisms of action of therapeutic ultrasound and its effects on reducing muscle pain and improving function in TMD patients are promising for the future of dysfunction treatment.

#### IV. FINAL CONSIDERATIONS

The consequences of TMD on individuals are numerous. From headaches to psychosocial changes, a variety of signs and symptoms are found in sufferers. Therefore, various treatments are offered, ranging from laser therapy and myorelaxant splints to surgical interventions.

Results like those presented in this study demonstrate the importance of paying attention to current and necessary content such as treatments for pain triggered by temporomandibular disorders.

Thus, it is hoped to provide support and incentives for further research on updates involving effective treatments against the damage caused by TMD.

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