Clinical Practice Guideline: **Temporomandibular Joint Disorder**

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GUIDELINES

American Specialty Health – Specialty (ASH) considers conservative approaches (physical therapy and manual therapy such as active and passive exercises, postural training, Temporomandibular Joint mobilizations/manipulative therapy, and myofascial therapy) to be medically necessary when used in combination with one another.

ASH considers electro-physiotherapy modalities (transcutaneous electrical nerve stimulation [TENS] and/or pulsed radio-frequency energy [PRFE]) and laser/light therapy (LLLT) for the treatment of temporomandibular joint disorder as not medically necessary. Clinical evidence does not support the use or the effectiveness of these modalities for treatment of Temporomandibular Disorder (TMD). Additionally, pulsed radio-frequency energy (PRFE) has a negative benefit-risk profile and presents a health and safety risk when used due to its physical properties. There is some evidence that LLLT may improve function, but further research is needed to confirm results. There is also some evidence that dry needling improves pain and function, but again, further research is needed to confirm results. For additional information, please see the *Electric Stimulation for Pain, Swelling and Function in a Clinic Setting (CPG 272-S)*, *Laser Therapy (LT) (CPG 30 – S)*, and *Passive Physiotherapy Modalities (CPG 121-S)* clinical practice guidelines.

ASH considers the use of acupuncture for the symptomatic relief of temporomandibular joint pain as medically necessary. Please see the *Acupuncture Services Medical Policy/Guideline (CPG 264-S)* clinical practice guideline for additional information.

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DESCRIPTION/BACKGROUND

The temporomandibular joint (TMJ), a synovial hinge joint, is located where the mandible joins the temporal bone via an intra-articular disc. This complex synovial system is further comprised of articulating ligaments and masticatory muscles. The TMJ is functioning properly when the right-sided and left-sided joints are synchronized during movement. It is also one of the most frequently utilized joints within the body, used up to 2,000 times a day for such functions as mastication, swallowing, respiration, and speech.

TMD can be classified collectively as temporomandibular joint and muscle disorders that cause pain and dysfunction in the jaw joint and the muscles that control jaw movement or surrounding soft tissues. Normal mandible movement requires coordination between these structures to maximize function and minimize the damage to surrounding structures. A rather unique feature of temporomandibular joint articulation is that it has two joints. The articular disc between the condyle and the temporal bone serves to separate the structures into two separate joint cavities. In the inferior joint between the head of the mandibular condyle and the articular disc, the movement is almost completely of a rotary or hinge type; whereas in the superior joint between the temporal bone and the articular disc the movement is gliding, or translational.

The numerous epidemiological studies on the occurrence of TMD in the general population indicate a number of consistent findings. Firstly, signs of TMD appear in about 60–70% of the general population, yet only about one in four people with signs are actually aware of or report any symptoms. The frequency of severe disorders that are accompanied by headache and facial pain, and that are characterized by urgent need of treatment is 1–2% in children, approximately 5% in adolescents and 5–12% in adults. Among those who seek treatment for TMD, by far the great majority are females, outnumbering males by at least four to one – although it is suspected that TMD affects both males and females in almost equal numbers in the general population.

Similar to other musculoskeletal disorders, pain during function, or while at rest is the primary reason that therapy is sought. Less commonly, patients seek TMD therapy for temporomandibular joint catching and locking, masticatory stiffness, limited mandibular range of motion, temporomandibular joint dislocation, and occlusal changes. Temporomandibular joint noises (e.g., clicking, popping) are common among the general population, however, this is generally not a concern for patients and practitioners; hence are not commonly treated.

DIAGNOSTIC CONSIDERATIONS IN THE TREATMENT OF TMD

This disorder can be classified into three groups or types: disc displacement/internal derangement, muscle disorders, and arthroses. The most common disorder of the temporomandibular joint is disc displacement. In essence, this is when the articular disc, attached anteriorly to the superior head of the lateral pterygoid muscle and posteriorly to

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the retrodiscal tissue, becomes displaced from between the condyle and the fossa, so that the mandible and temporal bone contact is made on something other than the articular disc. This, as explained above, is usually very painful, because disc displacement can lead to the development of secondary inflammatory changes and progressive degradation of the articular cartilage (Maizlin et al., 2010). Muscle disorders include pain dysfunction syndrome, myofascial pain, and myofascial pain syndrome. This type presents with pain in the jaw, temple, face, preauricular area or inside the ear, at rest or during function. Lastly, arthroses TMD are comprised of arthritis (including osteo-, rheumatoid, traumatic, and psoriatic arthritis), arthrosis and ankyloses (such as ankylosing spondylitis affecting the temporomandibular joint). Arthroses present with joint sounds, limited mandibular movements and pain, and can be secondary to muscular or disc displacement TMD.

The quality of the pain is generally an ache, pressure, and/or dull pain and may include a background burning sensation. There may also be episodes of sharp pain, and when the pain worsens, the primary pain quality may become a throbbing sensation. Patients with TMD tend to report that their pain is intensified by events such as stress, clenching, and eating, while it is relieved by relaxing, applying heat to the painful area, and taking over-the-counter analgesics. While the patient may be experiencing pain, it is useful to note that TMD can also be associated with various comorbidities such as tension headache, whiplash, fibromyalgia, tinnitus, vertigo, hearing loss, abnormal swallowing, hyoid bone tenderness, and otalgia.

Current insight into TMD indicates its etiology is multifactorial; whereas historically, occlusion of the jaw was considered the primary cause of TMD. Therefore, establishing a concise mode of treatment for the condition presents a challenge to the health care practitioner. A collaborative, interdisciplinary effort between practitioners in the diagnosis and management of TMD is thus encouraged.

The first line of non-surgical treatment for TMD has traditionally been physiotherapy, pharmacotherapy, and splint therapy. However, TMD treatment trends in recent decades have leaned toward multi-modal as well as multi-disciplinary management, in line with that of other chronic musculoskeletal conditions. Such strategies often suggest the use of less invasive interventions such as biofeedback, cognitive and behavioral therapies, chiropractic, and acupuncture.

EVIDENCE REVIEW

A systematic review by Brantingham et al. (2013) identifies 5 trials for the treatment of TMD with what it calls “Manual and Manipulate Therapy” (MMT). The range of therapies comprising MMT include exercise, mobilization, manual distraction, massage, muscle relaxation and intra-oral myofascial therapy (IMT). Of these 5 clinical studies, 4 are randomized clinical trials and 1 a non-randomized trial. The review concludes that there is limited (level B) evidence supporting the use of MMT for TMD treatment. This is based on the finding of "2 high-quality, 2 medium-quality and 1 low quality trials." It further concludes that the following interventions provide benefits for TMD: "intraoral myofascial therapy (IMT), post isometric relaxation, manual distraction, and self-mobilization in conjunction with a variety of exercises and gentle, high-velocity (very) low-amplitude manipulation, soft tissue MMT, or extra-oral soft tissue mobilization alone or as multimodal care." Finally, the review notes that in addition to these 5 trials there is a large body of mixed high, moderate, and low level evidence from a variety of studies including case series, case reports, single cohort pre-post studies, etc.

Of the 5 studies reviewed, 3 have very small (n<30) sample sizes and would be more properly viewed as pilot studies. Of the 2 larger studies (Kalamir et al., 2012; Minakuchi et al., 2001), only the Kalamir study reported positive results. Additionally, the heterogeneity of treatments, patient inclusion criteria and outcome measures represented by these studies are inconsistent and further studies with improved controls are necessary to demonstrate the effectiveness of manual manipulative therapy for the treatment of TMD. Two studies (Kalamir et al., 2010; Kalamir et al., 2012) did use a common treatment of intra-oral myofascial therapy (IMT). George et al. (2007) investigated the effects of manual therapy applied to the cervical-cranial junction to determine effects on mouth-opening capacity within an asymptomatic population. A total of 101 participants were randomly assigned to either an Active Release Technique (ART) group; high-velocity, low-amplitude manipulation (HVLA) group; or control group. A blinded investigator measured mouth opening using a TheraBite range of motion scale. Participants received ART to the suboccipital or HVLA to the cervical spine at C1 or sat with an investigator for 3 minutes with no treatment. After the treatment session, mouth opening was re-measured. ART and HVLA to the cervical spine did not significantly improve mouth opening in this asymptomatic population.

Alves et al. (2013) conducted a systematic review to identify whether mandibular manipulation technique is an effective and safe technique for the treatment of the temporomandibular joint disk displacement without reduction. Only 2 studies of medium quality fulfilled all the inclusion criteria. There is no sufficient evidence to support the effectiveness of the mandibular manipulation therapy, and therefore its use remains questionable. The analysis of the results suggested that additional high-quality randomized clinical trials are necessary and should focus on methods for data randomization and allocation, on clearly defined outcomes, on a priori calculated sample size, and on an adequate follow-up strategy. There are 2 additional randomized controlled trials (RCTs) that are not identified by the Brantingham review which are relevant. Kalamir et al. (2013) carried out an RCT (*n*=46) again comparing intra-oral myofascial therapies (IMT) to education, self-care, and exercise for TMD. This study evaluated short-term differences, over a course of 6 weeks (each patient receiving 2 therapy sessions per week), in pain and mouth opening range between IMT and an exercise program. While the study concluded that IMT presented a decrease in pain and increased mouth opening range, the results were not regarded as clinically significant.

Calixtre et al. (2015) studied manual therapy for the management of pain and limited range of motion in subjects with signs and symptoms of temporomandibular disorder. Their aim of this systematic review is to synthetize evidence regarding the isolated effect of MT in improving maximum mouth opening (MMO) and pain in subjects with signs and symptoms of TMD. Myofascial release and massage techniques applied on the masticatory muscles were more effective than control (low to moderate evidence) but as effective as toxin botulinum injections (moderate evidence). Upper cervical spine thrust manipulation or mobilization techniques were more effective than control (low to high evidence), while thoracic manipulations were not. There was moderate-to-high evidence that MT techniques protocols were effective. In conclusion, there is widely varying evidence that MT improves pain, MMO and pressure pain threshold (PPT) in subjects with TMD signs and symptoms, depending on the technique. Further studies should improve their design to strengthen clinical relevance.

Martins et al. (2016) studied the efficacy of musculoskeletal manual approaches (e.g., mobilization, manual traction, manipulation, myofascial release, trigger point therapy, manual translations) in the treatment of temporomandibular joint disorder within a systematic review with meta-analysis. From the 308 articles identified by the search strategy, only 8 articles met the inclusion criteria. The meta-analysis showed a significant difference ($p < 0.0001$) and large effect on active mouth opening and on pain during active mouth in favor of musculoskeletal manual techniques when compared to other conservative treatments for TMD. Authors concluded that musculoskeletal manual approaches are effective for treating TMD. In the short term, there is a larger effect regarding the latter when compared to other conservative treatments for TMD.

McNeely et al. (2006) reviewed the efficacy of exercise and postural therapy interventions for the treatment of TMD. This review is notable for its clear and explicit reporting of study quality on the 5-point Jadad scale. Four studies examined the effect of exercise interventions on TMD. However, the methodological quality of these 4 studies was considered weak. Two studies examined the effect of posture training (in combination with other therapies) on myogenous TMD and reported significant improvements in pain and oral opening in favor of the addition of postural exercise training. After 1 month, Komiyama et al. (1999) found a significant increase in mouth opening in patients who received postural training compared with patients receiving only cognitive intervention or compared with the control group. Wright et al. (2000) found a statistically significant improvement in maximum pain-free opening, pain threshold, and the modified symptom severity index in patients receiving postural treatment compared with patients receiving self-management instructions alone. Carmeli et al. (2001) compared the effect of manual therapy in combination with active exercise with the effect of treatment with occlusal splint therapy on anteriorly displaced temporomandibular disks on 36 patients with arthrogenous TMD. The authors reported significant improvement in pain and oral opening in favor of the manual therapy/exercise group. Grace et al. (2002) examined the benefit of an oral exercise device compared to traditional therapies, including when the oral exercise device was used as part of a home program, on oral opening, pain, and wellness in patients with mixed TMD. Results indicated that the study groups demonstrated significant clinical improvement. However, the groups did not differ significantly from each other in degree of patient improvement. McNeely et al. (2006) further reviewed the efficacy of various electro-physiotherapy modalities in the treatment of TMD pain and dysfunction and reported on 6 studies (2 strong studies and 4 weak studies). There was considerable heterogeneity among the studies in the type of TMD, the chosen modality and comparison group, and in the frequency and duration of the treatment.

In the double-blind, placebo-controlled study by Al-Badawi et al. (2004), forty patients received 6 treatments of pulsed radio-frequency energy (PRFE) therapy, however PRFE was not found to be significantly better than sham PRFE for arthrogenous TMD pain. Treacy et al. (1999) reported that 20 sessions of transcutaneous electrical nerve stimulation (TENS), were not significantly better than muscular awareness relaxation therapy (MART) or sham TENS (n=23 patients). Significant improvements were found, however, in oral opening and electromyographic activity for the MART group when compared with treatment with TENS and sham TENS. The Treacy study is methodologically weak due to small sample size, lack of double blinding, and inadequate data collection methods.

A review by List and Axelsson (2010) examined the set of systematic reviews for the entire range of treatments for TMD including surgery, occlusal appliances, medication, as well as physical and manual therapies. This review found that there was great variability in quality and methodology of the reviews as well as in the primary studies, making definitive conclusions impossible. This analysis concluded that occlusal appliances, acupuncture, behavioral therapy, jaw exercises, postural training, and some pharmacological treatments were effective for TMD. There was insufficient evidence for effectiveness for electro-physiotherapy modalities.

Moraes et al. (2013) studied therapeutic exercises for the control of temporomandibular disorders. Their aim was to conduct a literature review concerning the types of exercises available and the efficacy for the treatment of muscular TMD. The results included 7 articles which reported therapeutic exercises to be effective for the treatment of muscular TMD. However, these studies were deemed limited with regards to the conclusions because the exercises were combined with other conservative treatments. Other limitations included: small samples, lack of control group and no detailed exercise description, which should have included intensity, repetition, frequency, and duration. Authors conclude that although therapeutic exercises are considered effective in the management of muscular TMD, the development of randomized clinical trials is necessary, since many existing studies are still based on the clinical experience of professionals. Another study, Kraaijenga et al. (2014), compared in a randomized controlled clinical trial (RCT) the application of the TheraBite® (TB) Jaw Motion Rehabilitation System with a standard physical therapy (PT) exercise regimen for the treatment of myogenic temporomandibular disorder (TMD). Mandibular function was assessed with the mandibular function impairment questionnaire (MFIQ). Pain was evaluated using a visual analog scale, and maximum inter-incisor (mouth) opening (MIO) was measured using the disposable TB range of motion scale. After six-week follow-up, patients using the TB device reported a significantly greater functional improvement (MFIQ score) than the patients receiving regular PT exercises (P=0.0050). At 6 weeks, no significant differences in pain, and active or passive MIO were found between the two groups. At 3 months, patients in both treatment groups did equally well, and showed a significant improvement in all parameters assessed. This RCT showed that both treatment modalities are equally effective in relieving myogenic TMD symptoms, but that the use of the TB device has the benefit of achieving a significantly greater functional improvement within the first week of treatment.

Rashid et al. (2013) investigated the perceived effectiveness of physiotherapy for patients with TMD among consultants in oral and maxillofacial surgery (OMFS). A total of 208 responded (58%) and 72% considered physiotherapy to be effective. Amongst these respondents, jaw exercises (79%), ultrasound (52%), manual therapy (48%), acupuncture (41%) and laser therapy (15%) were considered to be effective. Twenty-eight percent of respondents did not consider physiotherapy to be effective. Reasons for this included lack of knowledge or expertise of the physiotherapist (41%) and lack of awareness of the benefits of physiotherapy (28%). Despite limited evidence to support its effectiveness, approximately three-quarters of OMFS consultants in the UK regard physiotherapy to be beneficial in the management of TMD. Chen et al. (2015) evaluated the efficacy of low-level laser therapy (LLLT) in the treatment of temporomandibular disorders (TMDs). Fourteen highly qualified RCTs reporting on a total of 454 patients, which evaluated the effectiveness of LLLT for patients suffering from TMDs were retrieved. The results indicated that LLLT was not better than placebo in reducing chronic TMD pain However, the LLLT provided significant better functional outcomes in terms of maximum active vertical opening (MAVO), maximum passive vertical opening (MPVO), protrusion excursion (PE) and right lateral excursion (RLE). Authors conclude that this study indicates that using LLLT has limited efficacy in reducing pain in patients with TMDs. However, LLLT can significantly improve the functional outcomes of patients with TMDs.

In an article by Shaffer et al. (2014), conservative management of TMJ disorders is discussed. Authors state that physical therapy is the preferred conservative management approach for TMD. They suggest that the potentially appropriate plan of care components may include joint and soft tissue mobilization, trigger point dry needling, friction massage, therapeutic exercise, patient education, modalities, and outside referral. Management options should address both symptom reduction and oral function. Satisfactory results can often be achieved when management focuses on patient-specific clinical variables.

Wieckiewicz et al. (2015) presented the concepts of TMD pain clinical management based on the most current treatment plans. Results reported that the most common conservative treatments are massage therapy and individually fabricated occlusal splints. In addition to massage, other popular methods include manual therapy and taping, warming/cooling of aching joints, and light and laser therapy. Drugs are also commonly used. In the most severe cases of the temporomandibular joint degeneration, surgical restoration of the joint is sometimes applied. Authors conclude that conservative treatment including counselling, exercises, occlusal splint therapy, massage, manual therapy, and others should be considered as a first-choice therapy for TMD pain because of their low risk of side effects. In the case of severe acute pain or chronic pain resulting from serious disorders, inflammation and/or degeneration pharmacotherapy, minimally invasive and invasive procedures should be considered.

Gauer and Semidey (2015) reported on standard treatment for patients with TMD. They report that most patients improve with a combination of noninvasive therapies, including patient education, self-care, cognitive behavior therapy, pharmacotherapy, physical therapy, and occlusal devices. Nonsteroidal anti-inflammatory drugs and muscle relaxants are recommended initially, and benzodiazepines or antidepressants may be added for chronic cases. Referral to an oral and maxillofacial surgeon is indicated for refractory cases.

Armijo-Olivo et al. (2016) summarized evidence of randomized controlled trials that examined the effectiveness of MT and therapeutic exercise interventions compared with other active interventions or standard care for treatment of TMD. Randomized controlled trials involving adults with TMD that compared any type of MT intervention (e.g., mobilization, manipulation) or exercise therapy with a placebo intervention, controlled comparison intervention, or standard care were included. The main outcomes were pain, range of motion, and oral function. Forty-eight studies met the inclusion criteria and were analyzed. The overall evidence for this systematic review was considered low, with an unclear or high risk of bias. Most of the effect sizes were low to moderate, with no clear indication of superiority of exercises versus other conservative treatments for TMD. However, MT alone or in combination with exercises at the jaw or cervical level showed promising effects. Overall, there was no high-quality evidence, indicating that there is uncertainty about the effectiveness of exercise and MT for treatment of TMD.

According to Butts et al. (2017), a review of the literature revealed limited support of strengthening exercises targeting the muscles of mastication. There was also limited evidence for manual soft tissue work targeting muscles of mastication, which may be specifically related to the limited accessibility of the pterygoid muscles to palpation. For the reduction of pain, there was little to no evidence supporting splint therapy and electrophysical modalities, including laser therapy, ultrasound, TENs, and iontophoresis. However, for the reduction of pain and disability, non-thrust mobilization and high-velocity, low amplitude thrust manipulation techniques to the TMJ and/or upper cervical articulations that directly and indirectly target the TMJ joint capsule were generally supported in the literature. Studies that used dry needling or acupuncture of the lateral pterygoid and posterior, peri-articular connective tissue also led to significant improvements in pain and disability in patients with TMD. Thus, the most effective conservative management of TMD seems to be techniques best able to impact anatomic structures directly related to the etiology of TMD, to include the joint capsule, articular disc, and muscles of mastication, specifically the superior and inferior head of the lateral pterygoid.

Garrigós-Pedrón et al. (2018) investigated the effects of adding orofacial treatment to cervical physical therapy in patients with chronic migraine and temporomandibular disorders (TMD). A total of 45 participants with chronic migraine and TMD aged 18 to 65 years were randomized into two groups: a cervical group (CG) and a cervical and orofacial group (COG). Both groups continued their medication regimens for migraine treatment and received physical therapy. The CG received physical therapy only in the cervical region, and the COG received physical therapy in both the cervical and orofacial regions. Both groups received six sessions of treatment that consisted of manual therapy and therapeutic exercise in the cervical region or the cervical and orofacial regions. Scores on the Craniofacial Pain and Disability Inventory (CF-PDI) and the Headache Impact Test (HIT-6) were primary outcome variables, and the secondary outcome variables were scores on the Tampa Scale for Kinesiophobia (TSK-11), pain intensity measured on a visual analog scale (VAS), pressure pain thresholds (PPTs) in the temporal, masseter and extratrigeminal (wrist) regions, and maximal mouth opening (MMO). Data were recorded at baseline, posttreatment, and after 12 weeks of follow-up. There were 22 CG participants (13.6% men and 86.4% women) and 23 COG participants (13% men and 87% women). The ANOVA analysis revealed statistically significant differences for group × time interaction in CF-PDI, HIT-6 in the last follow-up, pain intensity, PPTs in the trigeminal region, and MMO, with a medium-large magnitude of effect. No statistically significant differences were found in the PPTs of the extratrigeminal region or in the TSK-11. Authors concluded that both groups reported a significant improvement in CF-PDI, HIT-6, and pain intensity. Cervical and orofacial treatment was more effective than cervical treatment alone for increasing PPTs in the trigeminal region and producing pain-free MMO. Physical therapy alone was not effective for increasing the PPTs in the extratrigeminal region (wrist) or decreasing the level of TSK-11.

Shimada et al. (2019) authored a review focused on the effects of exercise therapy for the management of painful TMD. The aims of this review were to summarize the effects of exercise therapy for major symptoms of painful TMD and to establish a guideline for the management of painful TMD, resulting in higher quality and reliability of dental treatment. In this review, exercise modalities are clearly defined as follows: mobilization exercise, muscle strengthening exercise (resistance training), coordination exercise and postural exercise. Furthermore, pain intensity and range of movements were focused as outcome parameters in this review. Authors concluded that mobilization exercise including manual therapy, passive jaw mobilization with oral appliances and voluntary jaw exercise appeared to be a promising option for painful TMD conditions such as myalgia and arthralgia. Calixtre et al. (2019) sought to determine whether mobilization of the upper cervical region and craniocervical flexor training decreased orofacial pain, increased mandibular function and pressure pain thresholds (PPTs) of the masticatory muscles and decreased headache impact in women with TMD when compared to no intervention. Sixty-one women with TMD were randomized into an intervention group (IG) and a control group (CG). The IG received upper cervical mobilizations and neck motor control and stabilization exercises for 5 weeks. The CG received no treatment. Pain intensity showed significant time-by-group interaction, with significant between-group differences at four and five weeks, with large effect sizes ($d > 0.8$). The decrease in orofacial pain over time was clinically relevant only in the IG. Change in headache impact was significantly different between groups, and the IG showed a clinically relevant decrease after the treatment. No effects were found for PPT or mandibular function. Authors concluded that women with TMD reported a significant decrease in orofacial pain and headache impact after 5 weeks of treatment aimed at the upper cervical spine compared to a CG.

Vier et al. (2019) systematically reviewed the effects of dry needling on orofacial pain of myofascial origin in patients with temporomandibular joint dysfunction. Seven trials were considered eligible. There was discrepancy among dry needling treatment protocols. Meta-analysis showed that dry needling is better than other interventions for pain intensity as well as than sham therapy on pressure pain threshold, but there is very low-quality evidence and a small effect size. There were no statistically significant differences in other outcomes. Authors suggested that clinicians can use dry needling for the treatment of temporomandibular joint dysfunction. However, due to the low quality of evidence and high risk of bias of some included studies, larger and higher quality studies are needed to assess the effects of dry needling on orofacial pain associated with temporomandibular joint dysfunction. Madani et al. (2020) compared the efficacy of low-level laser therapy (LLLT) versus laser acupuncture therapy (LAT) in patients with temporomandibular disorders (TMDs). In this randomized, double-blind clinical trial, 45 TMD patients were randomly divided into three groups: group 1 (LLLT), group 2 (LAT), and group 3 (placebo) underwent treatment with sham laser. There was no significant difference in mouth opening between the groups, but the amount of lateral excursive and protrusive movements was significantly greater in LLLT and LAT groups than the placebo group at some intervals. The overall pain intensity and pain degree at masticatory muscles (except temporal muscle) and TMJs were significantly lower in both experimental groups than the placebo group at most intervals after therapy. Authors concluded that both LLLT and LAT were effective in reducing pain and increasing excursive and protrusive mandibular motion in TMD patients. LAT could be suggested as a suitable alternative to LLLT, as it provided effective results while taking less chair time.

Reynolds et al. (2020) sought to determine the immediate and short-term effects of adding cervical spine high-velocity, low-amplitude thrust (HVLAT) to behavioral education, soft tissue mobilization, and a home exercise program on pain and dysfunction for people with a primary complaint of temporomandibular disorder (TMD) with myalgia. Fifty individuals with TMD were randomly assigned to receive cervical HVLAT or sham manipulation for 4 visits over 4 weeks. Participants in both groups received other treatments, including standardized behavioral education, soft tissue mobilization, and a home exercise program. Primary outcomes included maximal mouth opening, the numeric pain-rating scale, the Jaw Functional Limitation Scale (JFLS), the Tampa Scale of Kinesiophobia for TMD (TSK-TMD), and a global rating of change (GROC). Self-report and objective measurements were taken at baseline, immediately after initial treatment, and follow-ups of 1 week and 4 weeks. Results indicated that there was no significant interaction for maximal mouth opening, the numeric pain-rating scale, or secondary measures. The HVLAT group had lower fear at 4 weeks and improved jaw function earlier (1 week). The GROC favored the HVLAT group, with significant differences in successful outcomes noted immediately after baseline treatment (thrust, 6/25; sham, 0/25) and at 4 weeks (thrust, 17/25; sham, 10/25). Authors concluded that both groups improved over time; however, differences between groups were small. The additive clinical effect of cervical HVLAT to standard care remains unclear for treating TMD.

Delgado de la Serna et al. (2020) investigated the effects of adding cervico-mandibular manual therapies into an exercise and educational program on clinical outcomes in individuals with tinnitus associated with temporomandibular disorders (TMDs). Sixty-one patients with tinnitus attributed to TMD were randomized into the physiotherapy and manual therapy group or physiotherapy alone group. All patients received 6 sessions of physiotherapy treatment including cranio-cervical and temporomandibular joint (TMJ) exercises, self-massage, and patient education for a period of 1 month. Patients allocated to the manual therapy group also received cervico-mandibular manual therapies targeting the TMJ and cervical and masticatory muscles. Primary outcomes included TMD pain intensity and tinnitus severity. Patients were assessed at baseline, 1 week, 3 months, and 6 months after intervention by a blinded assessor. Authors reported that this clinical trial found that application of cervico-mandibular manual therapies in combination with exercise and education resulted in better outcomes than application of exercise/education alone in individuals with tinnitus attributed to TMD.

Fisch et al. (2020) explored if physical therapy is an effective approach to treating patients with TMJ disorders. They sought to determine the effect of conservative physical therapy interventions on pain, maximal mouth opening, and TMJ disability index for patients with

TMD. Medical records from 2013-2018 were retrospectively reviewed to identify patients and obtain demographic, baseline, and short-term outcomes of maximal mouth opening (MMO), pain, and temporomandibular disability index (TDI). A total of 100 patients were included. Significant changes were noted in MMO, pain rating, and TDI from initial evaluation to discharge from physical therapy. Sex, age, and weight did not affect the outcomes. There was also no correlation between the number of visits attended and change in MMO. Patients treated conservatively did show improvements in short term outcomes (MMO, pain rating, and TDI). These changes were statistically significant, indicating that conservative therapy may be a beneficial treatment option for patients with TMJ dysfunction. Future studies assessing the long-term outcomes of TMJ patients treated conservatively would determine if this treatment is beneficial in the long-term. In addition, researching the effectiveness of specific interventions for TMJ patients, and if certain TMJ disorders are more responsive to conservative care than others would be valuable in providing information on the effectiveness of conservative treatment in this patient population.

Fernández-de-Las-Peñas et al. (2020) aimed to discuss clinical reasoning based on nociceptive pain mechanisms for determining the most appropriate assessment and therapeutic strategy and to identify/map the most updated scientific evidence in relation to physical therapy interventions for patients with temporomandibular disorders (TMDs) in this narrative review. Authors conclude the following: the clinical examination of patients with TMDs should be based on nociceptive mechanisms and include the potential identification of the dominant, central, or peripheral sensitization driver. Additionally, the musculoskeletal drivers of these sensitization processes should be assessed with the aim of reproducing symptoms. Therapeutic strategies applied for managing TMDs can be grouped into tissue-based impairment treatments (bottom-up interventions) and strategies targeting the central nervous system (top-down interventions). Bottom-up strategies include joint-, soft tissue-, and nerve-targeting interventions, as well as needling therapies, whereas top-down strategies include exercises, grade motor imagery, and also pain neuroscience education. Evidence shows that the effectiveness of these interventions depends on the clinical reasoning applied, since not all strategies are equally effective for the different TMD subgroups. In fact, the presence or absence of a central sensitization driver could lead to different treatment outcomes. Authors report that it seems that multimodal approaches are more effective and should be applied in patients with TMDs. van der Meer et al. (2020) systematically evaluated the literature on the effectiveness of physical therapy on concomitant headache pain intensity in patients with TMD. Randomized or controlled clinical trials studying physical therapy interventions were included. Authors concluded physical therapy interventions presented small effect on reducing headache pain intensity on subjects with TMD, with low level of certainty. More studies of higher methodological quality are needed so better conclusions could be taken.

Aisaiti et al. (2021) evaluated the effect of photobiomodulation therapy (PBMT) (i.e., low level laser therapy) on painful temporomandibular disorders (TMD) patients in a randomized, double-blinded, placebo-controlled manner. Participants were divided into a masseter myalgia group (*n* = 88) and a temporomandibular joint (TMJ) arthralgia group (n = 87) according to the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD). Both groups randomly received PBMT or placebo treatment once a day for 7 consecutive days, 1 session. The PBMT was applied with a gallium-aluminum-arsenide (GaAlAs) laser (wavelength = 810 nm) at pre-determined points in the masseter muscle (6 J/cm2, 3 regions, 60 s) or TMJ region (6 J/cm2, 5 points, 30 s) according to their most painful site. Pain intensity was rated on a 0-10 numerical rating scale (NRS) and pressure pain thresholds (PPT), and mechanical sensitivity mapping were recorded before and after the treatment on day 1 and day 7. Jaw function was assessed by pain free jaw opening, maximum unassisted jaw opening, maximum assisted jaw opening, maximum protrusion and right and left excursion. Pain intensity in arthralgia patients decreased over time for both types of interventions, however, PBMT caused greater reduction in pain scores than placebo. For myalgia patients, pain intensity decreased over time but without difference between interventions. PPTs increased in both myalgia and TMJ arthralgia patients over time but without difference between interventions. Overall, PBMT was associated with marginally better improvements in range of motion compared to placebo in both myalgia and arthralgia patients. Pain intensity, sensory function and jaw movements improve after both PBMT and placebo treatments in myalgia and arthralgia patients indicating a substantial non-specific effect of PBMT.

Ahmad et al. (2021) evaluated the efficacy of LLLT in the treatment of temporomandibular joint disorder within a systematic review. Thirty-seven articles were considered eligible for this systematic review. Out of 37 studies, 33 (89.18%) were high methodological studies, which had an overall low risk of bias or with some concerns, while only 4 studies had a high risk of bias. Eighteen studies showed that LLLT was efficacious in diminishing TMD pain, whereas 12 studies showed that LLLT had similar efficacy as of placebo/controls/other intervention in TMD pain diminution. Four studies presented varied effects of LLLT on pain intensity, mandibular motion, EMG activity, and masticatory efficiency. Two studies revealed that LLLT improved the psychological and emotional aspects associated with TMDs, joint noises, masticatory efficiency, and EMG parameters, respectively. One study focused on subjective tinnitus, whereas another study suggested laser acupuncture (LAT) therapy as a suitable alternative to LLLT. The results demonstrate that LLLT appears to be efficient in diminishing TMD pain with variable effects on the outcome of secondary parameters. The results demonstrate that LLLT appears to be efficient in diminishing TMD pain with variable effects on the outcome of secondary parameters. Also, LLLT provides advantages as the therapeutic regimen is non-invasive, reversible, with fewer adverse effects, and may also improve the psychological and emotional aspects associated with TMDs. Therefore, this systematic review highlights the role of LLLT as a promising therapeutic regimen for TMDs.

Zhang et al. (2021) compared the effects of exercise therapy and occlusal splint therapy on pain and mobility in individuals with painful temporomandibular disorders (TMD) in a systematic review. Six studies were included (498 patients: 251 occlusal splint therapy, 247 therapeutic exercise). The results revealed that exercise therapy was not superior to occlusal splint therapy for pain reduction in patients with painful TMD. The effectiveness of occlusal splint therapy and exercise therapy was found to be equivalent in the maximum mouth-opening range, right laterotrusion, left laterotrusion, and protrusion for painful TMD patients. Authors concluded that given the limitations of the study, the small number of studies included in the sub-analysis for pain relief and the maximum mouth-opening range, and the small overall standardized mean difference for pain relief and mandibular movement observed, no high-quality evidence was found to distinguish the clinical effectiveness between occlusal splint therapy and exercise therapy for painful TMD patients. It appears that more randomized controlled trials comparing the effects of exercise therapy and occlusal splint therapy need to be implemented.

Urbański et al. (2021) compared the degree of relaxation of the anterior part of the temporal muscles and the masseter muscles, achieved through the use of post-isometric relaxation and myofascial release methods in patients requiring prosthetic treatment due to temporomandibular joint disorders with a dominant muscular component. Sixty patients who met the inclusion criteria were alternately assigned to one of the two study groups: (I) patients received post-isometric relaxation treatment (PIR), and (II) patients received myofascial release treatment (MR). The series of 10 treatments were performed in both groups. The comparative assessment was based on physiotherapeutic examination, a surface electromyography (sEMG) of the anterior temporal and masseter muscles and the intensity of spontaneous masticatory muscle pain, assessed using the Visual Analogue Scale (VAS). Authors observed a significant decrease in the electrical activity of examined muscles and a significant drop in the intensity of spontaneous pain in the masticatory muscles both in group I and II. There were no significant differences between groups. Both therapeutic methods may be used as successful forms of adjunctive therapy in the prosthetic treatment of TMD.

Kulesa-Mrowiecka et al. (2021) aimed to present the occurrence of HJS among patients with myogenic TMD and disc displacement with reduction. The secondary goal was to assess the effectiveness of physiotherapy directed to TMD with coexisting HJS. The study involved 322 patients with symptoms of TMD. HJS was diagnosed using the Beighton Scale, which confirmed its occurrence in 26 cases. A total of 79 subjects (7 males and 72 females; mean age, 33.9 ± 10.4 years) were selected and divided into two groups: HJS + TMD (n = 26; 2 males and 24 females; mean age, 27.1 ± 9.4 years) and TMD (n = 53; 5 males and 48 females; mean age, 37.4 ± 9.2 years). These patients completed 3-week physiotherapy management. Before and after physiotherapy, the myofascial pain severity on Numeric Pain Rating Scale, linear measurement of maximum mouth opening, and opening pattern, were assessed. A statistically significant improvement was obtained in decreasing myofascial pain in both groups. Coordination of mandibular movements was achieved in both groups. Generalized joint hypermobility occurred among patients with TMD. Physiotherapy directed to TMD was effective in reducing myofascial pain and restoring TMJ's coordination also in patients with HJS.

Shousha et al. (2021) assessed the efficacy of low-level laser therapy (LLLT) as compared to occlusive splint therapy (OST) on the TMJ opening index (TOI) and sEMG of masticatory muscles. A total of 112 female subjects suffering from unilateral myogenous TMD, aged 21-30 years-old, were recruited and divided into 3 groups: LLLT, soft occlusive splint therapy OST, and a waitlist group as controls. Outcome measures included TMJ opening index (TOI), Visual analogue scale (VAS), and surface electromyography (sEMG). Results noted a significant reduction was reported in TOI, VAS and the sEMG within the LLLT and OST groups as well as significant decrease in all outcomes between groups in favor of the LLLT group. Authors concluded that findings supported an evident short term therapeutic effect of the LLLT on improving VAS, TOI and sEMG in females suffering from myogenous TMD. Magri et al. (2021) sought to characterize short- and long-term assessment of the low-intensity laser therapy (LLLT) effectiveness in women with TMD of muscular origins and to evaluate whether the information about the treatment received (active or placebo) modifies the pain intensity. Forty-one women with painful TMD (31.7 ± 5.2 years) were divided into laser (n = 20) and placebo (n = 21) groups. The pain intensity was measured at the baseline, after the LLLT (T8), 6 and 12 months. At the 6-month follow-up, the groups received information about the active or placebo treatment. Results demonstrated that at T8 and 6-month, both active and placebo LLLT were effective in reducing pain. After one year, the groups showed similar pain. Active LLLT was more effective in reducing pain palpation and referred pain in the region of the TMJs. The information about the treatment modified the perceived pain intensity. Authors concluded that active and placebo LLLT are effective for painful TMD of muscular origins in the short-term. Information about the treatment impairs the subjective perception of pain.

Dinsdale et al. (2022) evaluated the effectiveness of conservative interventions on self-reported and physical measures of bite function in individuals with TMD in a systematic review. Eleven studies were eligible for this review. Interventions included splinting, photobiomodulation (PBM), needling, exercise, manual therapy, and patient education, which were evaluated using mastication-related pain, self-reported chewing difficulty, and bite force/endurance outcome measures. Findings suggested manual therapy, needling, oral splinting, exercise, and PBM interventions may improve bite function in TMD, although confidence in cumulative evidence ranged from moderate to very low. There was no evidence that patient education improved bite function. Authors concluded that conservative interventions may be helpful to address bite-related impairments associated with TMD, although further research is needed to improve the quality of evidence and direct clinical guidelines.

Asquini et al. (2021) aimed to evaluate the effectiveness of manual therapy applied specifically to the craniomandibular structures (Cranio-Mandibular Manual Therapy [CMMT]) on pain and maximum mouth opening in people with TMD. A total of 2,720 records were screened, of which only 6 (293 participants) satisfied the inclusion criteria. All studies showed some concerns in risk of bias, except for one, which was high risk of bias. The overall quality of evidence was very low for all outcomes because of high heterogeneity and small sample sizes. All studies showed a significant improvement in pain and maximum mouth opening for CMMT from baseline in the mid-term, but only 2 showed superiorities compared to other interventions. Given the high heterogeneity and small sample sizes of the included studies, a quantitative synthesis was not performed. Authors concluded that there is the need for future high methodology research investigating different manual therapy techniques applied to different regions and different populations (e.g., chronic versus acute TMD) to determine what is most effective for pain and maximum mouth opening in patients with TMDs. Tran et al. (2022) authored a knowledge-to-action rapid review of systematic reviews published in the past 5 years and guidelines published in the past 10 years concerning the management of TMD. In total, 62 systematic reviews and 9 guidelines considering a range of treatment modalities were included. In concordance with current guidelines, moderate evidence supports a multi-modal conservative approach towards initial management. Contrary to existing guidelines, occlusal splint therapy is not recommended due to a lack of supporting evidence. The evidence surrounding oral and topical pharmacotherapeutics for chronic TMD is low, whilst the evidence supporting injected pharmacotherapeutics is low to moderate. In concordance with current guidelines, moderate quality evidence supports the use of arthrocentesis or arthroscopy for arthrogenous TMD insufficiently managed by conservative measures, and open joint surgery for severe arthrogenous disease. Based on this, a management pathway showing escalation of treatment from conservative to invasive is proposed. La Touche et al. (2022) analyzed the effectiveness of exercise and manual therapy interventions in patients with disc displacement without reduction in a systematic review. Ten articles were included, according to the inclusion criteria. Most of the interventions showed statistically significant improvements in the primary outcomes. Results show that interventions based on therapeutic exercise or manual therapy may be beneficial and play a role in the treatment of disc displacement without reduction. Limited evidence suggests that exercise significantly improves mouth opening in comparison to splints. Due to the heterogeneity of the included studies, these results should be interpreted with caution.

Al-Moraissi et al. (2021) aimed to identify the best treatment for adult patients with M-TMD in a network meta-analysis (NMA). Authors identified randomized clinical trials (RCTs) which are comparing 2 or more of the following treatment modalities in patients with M-TMD: counseling therapy; occlusal appliances; manual therapy; laser therapy; dry needling; intramuscular injection of local anesthesia (LA) or botulinum toxin-A (BTX-A); muscle relaxants; hypnosis/relaxation therapy; oxidative ozone therapy; and placebo or no treatment. Primary outcome variables were the reduction of pain and mechanical sensitivity. The secondary outcome was the maximal mouth opening (MMO). Included in this NMA were 52 RCTs. At the most follow up moments, manual therapy, counseling therapy, occlusal splints therapy, and needling using BTX-A or LA as well as dry needling significantly decreased post-treatment pain intensity in M-TMDs, when compared to placebo. At short term (≤5 months), the 4 highest-ranked treatments for post-treatment pain reduction were manual therapy (83.5%, low quality evidence), ozone therapy (75.7%, very low quality evidence), counseling therapy (71.2%, moderate quality), and occlusal appliances (71.7%, moderate quality evidence). When intermediate term (≥6 months) was considered, BTX-A (85.8%, very low quality evidence), counseling therapy (80%, low quality evidence), occlusal appliances (62.8%, low quality evidence) and hypnosis (50.6%, very low quality evidence) were the 4 highest-ranked treatments. This NMA reveals that manual therapy can be considered the most effective treatment for M-TMD, followed by counseling treatment, intramuscular injection of LA, and occlusal appliances. However, considering the limitations of the studies included, and the scarcity of strong evidence, the present findings should be interpreted cautiously.

Kalladka et al. (2021) provided an overview of the etiopathogenesis, clinical features and diagnosis of TMD, and summarized the current trends in the therapeutic management in review. Effective treatment requires a clear diagnosis based on an understanding of pathophysiologic mechanisms, a detailed history with assessment of predisposing local and systemic factors, perpetuating factors, a comprehensive clinical evaluation, and a diagnostic workup. Authors concluded that a thorough history and clinical examination are the gold standards for diagnosis of TMD. The treatment goals for TMD are to control pain, restore mandibular function and facilitate the return to normal daily activity and improve the overall quality of life of a patient. They report that based on the evidence, conservative modalities including home care regimens, pharmacotherapy, intraoral appliance therapy, local anesthetic trigger point injections, physiotherapy and complementary modalities may be beneficial in patients with TMDs.

Ekici et al. (2022) evaluated the effectiveness of high-intensity laser therapy (HILT) in the short and long term in the treatment of patients with the myogenic temporomandibular joint disorder (TMD). This prospective, double-blind, controlled clinical study was conducted on patients with myogenic TMD at a university's oral and maxillofacial surgery clinic. Seventy-six patients were randomized into 2 groups (HILT, and control group), including 38 patients in one group. The patients were evaluated for pain, the range of motion of the jaw, disability, and quality of life. Assessments were performed before therapy (week 0) and after therapy (weeks 4 and 12). Data were evaluated using SPSS-20 and the level of significance was set at $p < 0.05$. There was no significant difference between the groups in terms of socio-demographic characteristics of the groups at the beginning of the study. In the 4th week, the VAS pain score was significantly decreased in the HILT group (47%) compared to the placebo HILT group (4%). The maximum mouth opening was significantly increased in the HILT group (27%) compared to the placebo HILT group (4%) at week 12. The HILT group showed a significant improvement in Jaw Functional Limitation Scale 20 (JFLS-20) and Oral Health Impact Profile (OHIP-14) compared to the placebo HILT group. Authors concluded that HILT is a highly effective, non-invasive therapeutic method for patients with myogenic TMD. Fertout et al. (2022) assessed the efficacy of transcutaneous electrical nerve stimulation (TENS) for the management of temporomandibular disorders (TMD) and to determine the indications and most appropriate application modalities. Fourteen articles were retained, corresponding to a total of 532 patients, among which, 285 had a TMD. Immediately after a TENS session, significant relief of pain (19.2% to 77%), significant functional improvement (mouth opening amplitude increased by between 8.7% and 19.46%), and reduced electromyographic activity of the anterior temporalis and masseter muscles were observed. However, studies comparing TENS to other physical medicine modalities (ultrasound and laser) reported equivalent results. Authors concluded that further randomized comparative clinical trials are necessary to optimize the use of TENS (program, duration of sessions, duration of treatment) for different types of TMD.

Busse et al. (2023) completed a comparative effectiveness study of available therapies for chronic pain associated with temporomandibular disorders (TMD). Because current clinical practice guidelines are largely consensus-based and provide inconsistent recommendations, they wanted to summarize the current evidence. Based on findings, patients living with chronic pain (≥3 months) associated with TMD, and compared with placebo or sham procedures, the guideline panel issued: (1) strong recommendations in favor of cognitive behavioral therapy (CBT) with or without biofeedback or relaxation therapy, therapist-assisted mobilization, manual trigger point therapy, supervised postural exercise, supervised jaw exercise and stretching with or without manual trigger point therapy, and usual care (such as home exercises, stretching, reassurance, and education); (2) conditional recommendations in favor of manipulation, supervised jaw exercise with mobilization, CBT with non-steroidal anti-inflammatory drugs (NSAIDS), manipulation with postural exercise, and acupuncture; (3) conditional recommendations against reversible occlusal splints (alone or in combination with other interventions), arthrocentesis (alone or in combination with other interventions), cartilage supplement with or without hyaluronic acid injection, low level laser therapy (alone or in combination with other interventions), transcutaneous electrical nerve stimulation, gabapentin, botulinum toxin injection, hyaluronic acid injection, relaxation therapy, trigger point injection, acetaminophen (with or without muscle relaxants or NSAIDS), topical capsaicin, biofeedback, corticosteroid injection (with or without NSAIDS), benzodiazepines, and β blockers; and (4) strong recommendations against irreversible oral splints, discectomy, and NSAIDS with opioids. These recommendations apply to patients living with chronic pain (≥3 months duration) associated with TMD as a group of conditions, and do not apply to the management of acute TMD pain. When considering management options, clinicians and patients should first consider strongly recommended interventions, then those conditionally recommended in favor, then conditionally against. In doing so, shared decision making is essential to ensure patients make choices that reflect their values and preference, availability of interventions, and what they may have already tried. Further research is warranted and may alter recommendations in the future.

Yao et al. (2023) explored the comparative effectiveness of available therapies for chronic pain associated with temporomandibular disorders (TMD). Two hundred thirty-three trials proved eligible for review, of which 153 (8,713 participants and 59 interventions or combinations of interventions) were included in network meta-analyses. All subsequent effects refer to comparisons with placebo or sham procedures. Effects on pain for 8 interventions were supported by high to moderate certainty evidence. The 3 therapies probably most effective for pain relief were cognitive behavioral therapy (CBT) augmented with biofeedback or relaxation therapy for achieving the minimally important difference (MID) in pain relief of 1 cm on a 10 cm visual analogue scale: 36%, therapist-assisted jaw mobilization, and manual trigger point therapy. Five interventions were less effective, yet more effective than placebo: CBT, supervised postural exercise, supervised jaw exercise and stretching, supervised jaw exercise and stretching with manual trigger point therapy, and usual care (such as home exercises, self-stretching, reassurance). Moderate certainty evidence showed 4 interventions probably improved physical functioning: supervised jaw exercise and stretching, manipulation, acupuncture, and supervised jaw exercise and mobilization. The evidence for pain relief or physical functioning among other interventions, and all evidence for adverse events, was low or very low certainty. Authors concluded that when restricted to moderate or high certainty evidence, interventions that promote coping and encourage movement and activity were found to be most effective for reducing chronic TMD pain.

Gebka et al. (2023) evaluated the effectiveness of soft tissue therapy and therapeutic exercises in female patients with pain, increased masseter muscle tension, and limited mandibular mobility. The study was conducted on a group of 82 women (G1) with the Ib disorder diagnosed in DC/TMD (Ib-myofascial pain with restricted mobility). The control group (G2) consisted of 104 women without diagnosed TMDs (normal reference values for TMJ ROM and masseter muscle sEMG bioelectric activity). The G1 group was randomly divided into 3 therapeutic groups in which the therapy was carried out for 10 days: therapeutic exercises (TE), manual therapy - massage and therapeutic exercises (MTM_TE), manual therapy - post-isometric muscle relaxation (PIR) and therapeutic exercises (MTPIR_TE). Each time after therapy, the intensity of pain and TMJ mobility were assessed. Massage, PIR, and self-therapy led to a decrease in sEMG at rest as well as in exercise. Each of the proposed forms of therapy showed a minimal clinically significant difference (MID) in the sEMG parameter at the endpoint, with the most considerable difference in the MTM_TE group. The forms of MT used were effective in reducing the patients' pain intensity; however, a significant difference between therapies occurred after 4 treatments. Analyzing the MID between methods, it was observed that self-therapy had an analgesic effect only after 8 treatments, while PIR after 3 and massage after 1 treatment. In terms of maximum mouth opening, a significant difference was obtained between monotherapy and each form of TM, i.e., massage and PIR. Analyzing mandibular lateral movements, the authors noted a significant difference in the proposed MT forms, of which massage treatments exceeded the effectiveness of PIR. Authors concluded that soft tissue manual therapy and therapeutic exercise are simple and safe interventions that can potentially benefit patients with myogenic TMDs, with massage showing better analgesic effects than PIR.

Zhang et al. (2023) evaluated the efficacy of laser therapy in temporomandibular disorders (TMD). A total of 28 randomized controlled trials were included. Authors concluded that laser therapy can effectively reduce pain but have small effect on improving mandibular movement of TMD patients. More well-designed RCTs with large sample sizes are needed for further validation. These studies should report detailed laser parameters and provide complete outcome measure data.

Serrano-Muñoz et al. (2023) aimed to determine the effectiveness of different electrical stimulation modalities in patients with temporomandibular disorders for reducing musculoskeletal pain, increasing the range of movement, and improving muscle activity. The main outcome measure was pain intensity. Seven studies were included in the qualitative analysis and in the quantitative analysis (n = 184 subjects). The overall effect of electrical stimulation on pain reduction was statistically superior to sham/control. The overall effect on range of movement of the joint and muscle activity were not significant. Transcutaneous electrical nerve stimulation (TENS) and high-voltage current stimulation reduces pain intensity clinically in people with temporomandibular disorders with a moderate quality of evidence. On the other hand, there is no evidence of the effect of different electrical stimulation modalities on range of movement and muscle activity in people with temporomandibular disorders with a moderate and low quality of evidence respectively.

de Castro-Carletti et al. (2023) summarized the evidence from randomized controlled trials and controlled trials that examined the effectiveness of electrotherapy in the treatment of patients with orofacial pain. The overall quality of the evidence for pain intensity was very low. Although the results should be carefully used, transcutaneous electric nerve stimulation (TENS) therapy showed to be clinically superior to placebo for reducing pain after treatment and at follow-up and reduce tenderness after treatment and at follow-up in subjects with mixed temporomandibular disorders. Authors concluded that results of this systematic review support the use of TENS therapy for patients with mixed temporomandibular disorders to improve pain intensity, and tenderness demonstrating that transcutaneous electric nerve stimulation is superior to placebo. There is inconsistent evidence supporting the superiority of TENS against other therapies.

Idáñez-Robles et al. (2023) analyzed the effectiveness of exercise therapy in improving pain and active or passive maximum mouth opening in patients with temporomandibular disorders. Randomized controlled trials evaluating the effect of exercise therapy on pain and on active and passive maximum mouth opening in patients with temporomandibular disorders were included (16 studies with 812 participants). Exercise therapy was effective in reducing pain and increasing the pain pressure threshold, active and passive maximum mouth opening. On pain pressure threshold, exercise therapy was better than physiotherapy approach (e.g., manual therapy and electrotherapy). Author concluded that therapeutic exercise is an effective therapy to reduce pain and increase pain pressure threshold and active and passive maximum mouth opening in patients with temporomandibular disorders.

de Oliveira-Souza et al. (2023) determined the effectiveness of laser therapy for managing patients with orofacial pain (OFP). In addition, authors sought to determine which parameters provide the best treatment effects to reduce pain, improve function, and quality of life in adults with OFP. Eighty-nine studies were included. Most studies (*n* = 72, 80.9%) were considered to have a high risk of bias. The results showed that laser therapy was better than placebo in improving pain, maximal mouth open (MMO), protrusion, and tenderness at the final assessment, but with a low or moderate level of evidence. The best lasers and parameters to reduce pain were diode or gallium-aluminum-arsenide (GaAlAs) lasers, a wavelength of 400-800 or 800-1500 nm, and dosage of <25 J/cm2. Authors concluded that laser therapy was better than placebo to improve pain, MMO, protrusion, and tenderness. Also, it was better than occlusal splint to improve pain, but not better than TENS and medication.

Tanhan et al. (2023) investigated the efficacy of different types of physiotherapy approaches in individuals with cervical myofascial painful temporomandibular disorders (TMDs). Seventy-five participants with myofascial pain of jaw muscles and cervical myofascial pain were randomized into 3 groups: exercise group (E), low-level laser therapy group (LLLT), and manual pressure release group (MPR). All patients were assessed before treatment and after 12 sessions of treatment. Significant improvement was seen in all groups' pressure pain threshold (PPT) values. Some masticatory and neck muscles' PPT changes in MRP and LLLT groups were significantly higher than the exercise group. Authors concluded that exercise therapy is an effective approach for treatment of TMDs. Additionally, LLLT combined with exercise and MPR combined with exercise have better effects than only exercise therapy. Multimodal treatment approaches should include exercise to achieve better results in clinical practice.

Bednarczyk et al. (2024) assessed the effectiveness of cervical rehabilitation interventions on pain intensity and sensitivity in adults with myogenic temporomandibular disorders MTMD compared to comparison intervention such as placebo, sham treatment, education or no intervention. Authors selected randomized controlled trials (RCTs) based on adult populations with MTMD who had a cervical rehabilitation intervention which was defined as any conservative intervention targeting the anatomical structures of the cervical spine.

The primary outcome measures for pain were self-reported pain intensity and pain sensitivity through the pressure pain threshold (PPT) of the masseter and temporalis muscles. Secondary outcome measures of maximal mouth opening (on MMO) were included. General search yielded 2,647 studies where seven RCTs met eligibility criteria with low to some concerns in their risk of bias. Pain intensity, PPT of the masseter muscle and the temporalis muscles showed large treatment effect estimates favoring cervical rehabilitation interventions compared to no treatment, sham cervical treatment, patient education or non-cervical neuromuscular techniques. Compared to control interventions, one type of cervical rehabilitation intervention, cervical manual therapy alone or in combination with a neck exercise program was associated with statistically significant, large treatment effect estimates on pain intensity. This review found that in the short-term, cervical rehabilitation interventions especially upper cervical MT alone or in combination with a neck exercise program are effective in improving multiple pain outcomes in adults with MTMD. However, further research is needed to measure the long-term effects of this type of intervention.

Romeo et al. (2024) compared the effects of combining musculoskeletal physiotherapy with occlusal splint and education (EG) against occlusal splint and education alone (CG) in patients with chronic M-TMD. In this double-blind randomized controlled trial, 62 participants were assigned to either EG or CG. The primary outcomes were measured using the Visual Analogue Scale (VAS) in centimeters, which included pain levels at rest (VAS rest), maximum oral opening (VAS open), and during chewing (VAS chew). The secondary outcome was the range of motion (ROM) for maximum oral opening. Both interventions lasted 3 months, with outcomes assessed at baseline, post-treatment and 3 months post-treatment. Intention-to-treat analysis revealed significant improvements favoring EG (VAS rest = -1.50 cm VAS open = -2.00 cm; VAS chew = -1.71 cm; ROM = 4.61). Additionally, VAS measures were influenced by follow-up times. At baseline, EG demonstrated higher number of responders compared to CG for VAS open and VAS chew. Authors concluded that adding musculoskeletal physiotherapy to occlusal splint and education yields better outcomes in terms of pain reduction and ROM improvement in patients with chronic M-TMD.

Ferrillo et al. (2024) evaluated the efficacy of rehabilitative approaches on otologic symptoms in patients with TMD in a systematic review of randomized controlled trails (RCTs). Out of 931 papers suitable for title/abstract screening, 627 articles were assessed for eligibility. Five studies were included reporting the efficacy of occlusal splint therapy, low-level laser therapies, and physical therapy in patients diagnosed with secondary otalgia or tinnitus associated with TMD. No RCTs evaluating other otologic symptoms, ear fullness, dizziness or vertigo were found. Results of this systematic review suggested that rehabilitative approaches might be effective in improving secondary otalgia and tinnitus in TMD patients. Thus, further RCTs with a higher level of evidence and more representative samples should be conducted to better understand the effects of TMD therapy on otologic complains.

Chamini et al. (2024) investigated the therapeutic or placebo effect of LLLT for TMD, and to compare it with standard treatment methods. A total of 42 patients with TMD were randomly assigned to three groups: group A received LLLT, group B was a placebo group and group C was a control group that received only standard treatment. The laser groups received gallium-aluminum-arsenide laser treatment twice a week for 10 sessions. Patients' jaw movement rate indicators and VAS index were evaluated at the start of treatment, and indicators were re-recorded every week for 5 weeks. All groups showed significant improvement in VAS indicators, lateral jaw movements, forward jaw movement but not for maximum mouth opening. No significant difference was observed between the groups at the end of the study. Authors concluded that this study provides insights into LLLT's effectiveness for TMD, suggesting it cannot replace standard treatment alone.

de la Barra Ortiz et al. (2024) aimed to assess the effects of high-intensity laser therapy (HILT) on individuals suffering from temporomandibular joint disorders (TMDs). The main outcome was pain intensity (VAS), with secondary outcomes including mouth opening (mm), disability (JFLS-20), and quality of life (OHIP-14). A meta-analysis was conducted to assess the pooled effect by calculating mean differences (MD) for these variables. The heterogeneity of the meta-analyses was explored using the I2 statistic. Three studies met the selection criteria and were included in the meta-analysis. The main risk of bias was the blinding of participants and treaters. Statistically significant differences in favor of HILT were observed for VAS and maximum mouth opening. HILT has been found effective in short-term pain relief and improvement of jaw opening in TMDs, potentially enhancing quality of life by facilitating activities such as chewing, jaw mobility, and communication. However, further research is needed to confirm its long-term effectiveness. Combining HILT with interventions such as occlusal splints or therapeutic exercises could potentially enhance its effects, leveraging the existing evidence supporting these treatments.

Zhu et al. (2024) investigated the impact of incorporating pre-existing exercise treatment regimens in improving the recovery of patients following surgery. Five studies were finally included for subsequent analysis; two were randomized controlled studies, and three were quasi-experimental. Exercises suitable for such patients encompass vertical, transverse, and horizontal stretching, among which vertical stretch can be divided into active and passive movements. The start time ranged from the first to the fifth week after surgery, with a duration of 1-6 months. The therapeutic effect of combining three exercise methods was best and was related to patient compliance. Exercise therapy positively affects postoperative rehabilitation in patients with temporomandibular joint ID. It is proposed that targeted, comprehensive studies be conducted to provide a basis for designing more sophisticated exercise therapy regimens and further confirm its curative effect.

Altuhafy et al. (2024) compared the effectiveness of combining photobiomodulation (PBM) with orofacial myofunctional therapy (OMT) in managing orofacial pain disorders. Randomized controlled trials (RCTs) focusing on PBM and OMT for the management of orofacial pain were included. A total of 10 RCTs were included, out of which 7 RCTs revealed that the combined approach of PBM and OMT had a more pronounced impact on diminishing pain and enhancing functional activity in patients with orofacial disorders. One study reported significant increases in pressure pain threshold for TMJ, masseter, and anterior temporalis muscles at both sides in the post-treatment compared with the pre-treatment in both groups. The risk of bias was low in 7, moderate in 2, and high in 1 study. The efficacy of a combined modality treatment of PBM with OMT for orofacial pain disorder shows promising results. However, further randomized controlled trials with extended follow-up periods standardized PBM and OMT parameters are warranted to obtain firm conclusions.

de Oliveira-Souza ALS et al. (2024) compiled and synthesized the evidence regarding the effectiveness of aerobic exercise (AE) compared with other treatments to reduce pain and disability of individuals with orofacial pain (OFP). Randomized controlled trials (RCT) or controlled trials including adults of both sexes with painful OFP diagnoses were targeted. The intervention of interest was AE (e.g., walking, cycling, running), compared to any other conservative and non-conservative therapy. The primary outcome was pain intensity. Out of 4,669 records screened, 4 manuscripts were included. However, 3 of them used the same population but presented different outcomes. These studies included subjects with headache associated with temporomandibular disorders (TMD) and general TMD. Both studies used aerobic exercise (AE) as the intervention of interest. Manual therapy (MT) plus exercise (Ex) (strengthening exercise (Str ex) or general exercises) were used as a comparison group. The combined treatment, including a multimodal therapy (AE + MT + Str ex), was superior to MT + Ex on pain intensity (orofacial pain [OFP] and headache intensity) at the end of the treatment and after 12-week follow-up. Also, the combination of 3 treatment modalities (AE + MT + Ex) was better on quality of life than AE alone and MT + Ex at the end of the treatment. Authors concluded that aerobic exercise plus MT and general exercises achieved the greatest positive effects on pain and other outcomes in the short/medium term in patients with OFP. However, the scientific evidence supporting the isolated effects of AE for OFP is limited, indicating the need for more studies. Further studies are also needed to elaborate guidelines when using AE for individuals with OFP.

Saini et al. (2024) aimed to identify peer-reviewed scholarly journal articles reporting the significance of physiotherapy interventions in managing TMJ ankylosis in a systematic review and meta-analysis. In addition, this study aimed to critically appraise the existing evidence on the prevalence and clinical presentation, physiotherapy intervention approaches, efficacy of physiotherapy interventions, adverse effects, and safety of physiotherapy interventions in TMJ ankylosis management. The primary electronic database search yielded 409 articles, of which 25 were included in this review. A secondary search was conducted from citations of the included studies, yielding 74 articles, of which six were included in the study. A significantly higher prevalence of bony ankylosis than fibrous ankylosis. In addition, there were significantly more unilateral than bilateral presentations. Moreover, there were 78 reported complications out of 245 subjects according to five included studies demonstrating a significant effect size with $p = 0.001$ following the treatment protocols. This study highlighted the prevalence of bony ankylosis in temporomandibular joint ankylosis, emphasizing its impact on patients' well-being. On the other hand, the results show that physiotherapy is essential to optimize postoperative outcomes and minimize adverse events such as re-ankylosis. Practitioners and healthcare professionals must monitor postoperative recovery and ensure strict adherence to physiotherapy protocols for optimal outcomes.

Dunning et al. (2024) compared the effects of dry needling and upper cervical spinal manipulation with interocclusal splint therapy, diclofenac, and temporomandibular joint (TMJ) mobilization in patients with temporomandibular disorder (TMD). One hundred-twenty patients with TMD were randomized to receive six treatment sessions of dry needling plus upper cervical spinal manipulation ($n = 62$) or interocclusal splint therapy, diclofenac, and joint mobilization to the TMJ ($n = 58$). Patients receiving dry needling and upper cervical spinal manipulation experienced significantly greater reductions in jaw pain intensity over the last 7 days and active pain-free mouth opening than those receiving interocclusal splint therapy, diclofenac, and TMJ mobilization at the 3-month follow-up. Authors concluded that dry needling and upper cervical spinal manipulation was more effective than interocclusal splint therapy, diclofenac, and TMJ mobilization in patients with TMD.

de Oliveira-Souza AIS et al. (2024) tested the effectiveness of an 8-week exercise program targeted to the neck muscles compared to manual therapy, and placebo treatments on orofacial pain intensity, jaw function, oral health-related quality of life (OHRQoL), and jaw range of motion (ROM) in women with Temporomandibular Disorders (TMD). In this randomized controlled trial, 54 women (between 18-45 years old) with a diagnosis of myofascial or mixed TMD were randomized into 3 groups: Neck motor control training (NTG), Manual Therapy Group (MTG), and Placebo Group (PG). All patients were evaluated with the Visual Analog Scale, Mandibular Function Impairment Questionnaire, Oral Health Impact Profile-14, and jaw Range of Motion (ROM) at baseline, immediately after treatment (after 8 weeks of treatment), one month, and three-month follow-up. NTG was significantly better than the PG group on pain and jaw function at the end of treatment, one- and three-month follow-up. For OHRQoL, NTG was significantly better than MTG and PG at the end of treatment and at three-month follow-up. The results of this project are encouraging, and they could be used to guide clinical practice in this field. Exercises targeted to the neck (which require low therapeutic supervision) could be a simple and conservative way to improve pain and disability for women with TMD with neck involvement.

Singh et al. (2024) assessed the effects of occlusal interventions in people diagnosed with temporomandibular disorders (TMD), compared to other interventions or no treatment, on joint pain, muscle pain at rest and when chewing, quality of life, discomfort, and recurrence. Authors included randomized controlled trials of occlusal interventions (splints or adjustment) for managing TMD compared with no treatment, placebo, occlusal splint with a different mechanism of action, or other active treatments. They included 57 studies (2,846 participants) that compared occlusal splints with no treatment, placebo, or another treatment. Most of the studies evaluated full hard stabilization splint (FHSS) as the occlusal splint. Key outcomes of interest were self-reported joint pain when chewing, muscle pain at rest and when chewing, discomfort, severity and frequency of joint noise, and recurrence rate. The duration of the studies ranged from 5 weeks to 84 months. The key results were measured between 4.4 weeks and 4 months. It is important to note that there is very low certainty in the evidence for all comparisons and outcomes assessed. There may be little to no difference in self-reported joint pain when chewing between occlusal splint (FHSS) and placebo (non-occlusal splint, or pharmacological therapy (diclofenac), but the evidence is very uncertain. Occlusal splint (FHSS) may reduce muscle pain when chewing compared to no treatment but may have little to no effect when compared to physical therapy (low-level laser) or acupuncture (with needles) in people with myofascial pain TMD, but the evidence is very uncertain. There may be little to no difference in muscle pain at rest when occlusal splint (FHSS) is compared to no treatment or physical therapy (physiotherapy) in myofascial pain TMD, but the evidence is very uncertain. There may be little to no difference in severity of joint noise when occlusal splint (FHSS) is compared to no treatment, but the evidence is very uncertain. When FHSS is compared to physical therapy (specifically, orofacial myofunctional therapy), physical therapy may reduce severity of joint noise, but the evidence is very uncertain. There may be little to no difference in frequency of joint noise when occlusal splint (FHSS) is compared to placebo (non-occlusal splint), occlusal splint with a different mechanism of action, or physical therapy (jaw exercise), but the evidence is very uncertain. Discomfort and recurrence rate were not reported in any study. We judged the certainty of the evidence to be very low for all outcomes in all comparisons due to limitations in study design and imprecision. Authors concluded that despite this review including 57 RCTs with 2,846 participants, but the final results are inconclusive, so the research questions remain unanswered. Occlusal splints of the FHSS type may reduce muscle pain when chewing compared to no treatment, but the evidence is very uncertain. Orofacial myofunctional therapy may reduce severity of joint noise compared to occlusal splint (FHSS), but the evidence is very uncertain. For all other comparisons and outcomes, there may be little or no difference between groups, although the evidence is also very uncertain for these findings. Overall, they found insufficient evidence to reach conclusions regarding the effectiveness of occlusal interventions for managing symptoms of TMD, despite the available studies including almost 3000 participants. To make a useful contribution to the debate about the best way to treat TMD, any further research must be well-designed, with enough participants to reach the optimal information size for meaningful results; it requires recruitment from primary care, consensus around key outcomes and measures, and, ideally, long-term follow-up of three to five years, plus inclusion of a cost-effectiveness component.

Ferrillo et al. (2025) evaluated the efficacy of conservative interventions in pain relief in patients with intracapsular temporomandibular disorders (TMD) in a systematic review with meta-analysis. Out of 3,372 papers, 13 RCTs were included, with 844 study participants. Most of them (n = 7) investigated the efficacy of splint appliance. Meta-analysis revealed that rehabilitative interventions had a significant overall effect size of 0.75, reporting splint appliance and laser therapy as significantly effective treatments. Findings of this systematic review with network meta-analysis suggested that conservative approaches might be effective in pain relief of intracapsular TMD patients.

Asquini et al. (2025) evaluated the effectiveness of Resistance Training (RT) as a standalone treatment for managing pain and improving neuromuscular performance in individuals with TMDs. Randomized controlled trials or nonrandomized studies of interventions were included when they compared the effect of RT targeting masticatory muscles on pain, neuromuscular performance, and maximum mouth opening in patients with TMDs versus other treatment modalities. From an initial 2177 articles, only three met the inclusion criteria and involved 108 participants. All the included studies demonstrated a decrease in pain intensity and an improvement in neuromuscular performance following RT, even if the superiority of RT over other interventions remains uncertain. However, the combination of moderate risk of bias, significant heterogeneity and small sample sizes resulted in a very low quality of evidence. Authors concluded that clinicians managing patients with TMDs should consider RT as an effective, conservative option in conjunction with other treatment modalities. Future methodologically robust studies with large sample sizes and clearly defined exercise protocols are needed to investigate the role of RT for reducing TMD-related pain by increasing load tolerance and addressing potential bruxism-related muscle overload.

Diaz et al. (2025) systematically evaluated the efficacy of LLLT in the management of TMD, focusing on its impact on pain reduction and functional improvement. Additionally, this review sought to identify the most effective laser parameters (wavelength, energy density, and duration of therapy) and compare LLLT outcomes with conventional treatment modalities. This systematic review analyzed 44 randomized clinical trials (RCTs) with 1,816 participants, confirming that low-level laser therapy (LLLT) significantly reduces pain intensity (60-70 % decrease on the Visual Analog Scale) and improves mandibular function (10-20 % increase in maximum mouth opening). The most effective laser wavelengths ranged from 810 to 940 nm, with energy densities of 3-12 J/cm^2. Longer treatment durations (>4 weeks) provided more sustained benefits. Compared to occlusal splints, NSAIDs, and TENS, LLLT showed superior or comparable pain relief with fewer side effects. However, variability in laser parameters and protocols remains a limitation. Authors concluded that LLLT is a safe and effective non-invasive treatment for

TMD, offering substantial benefits in pain management and functional recovery. Standardized protocols based on optimized dosimetry are needed to enhance clinical outcomes further.

Dinsdale et al. (2025) evaluated the effectiveness of conservative interventions on kinesiophobia and pain catastrophizing in adults with temporomandibular disorders. Twelve studies were included, comprising 815 participants (mean age = 42.2 years, 85 % female, most with myofascial/pain-related temporomandibular disorders). Interventions included cognitive behavioral therapy, pain neuroscience education ± exercise, manual therapy, occlusal splinting and hypnosis. There was low to very low confidence that cognitive behavioural therapy, pain neuroscience education plus exercise, and manual therapy may reduce pain catastrophizing in individuals with temporomandibular disorders, and low to very low confidence that pain neuroscience education and manual therapy may improve kinesiophobia. Authors concluded that cognitive behavioural therapy, pain neuroscience education and manual therapy may be effective in reducing kinesiophobia and pain catastrophizing in adults with temporomandibular disorders. Further research is needed to improve the quality of this evidence.

Scrase et al. (2025) investigated the effects of therapeutic exercise on patient-reported measures of activity, participation and corresponding QOL in individuals with TMD. Twelve studies were eligible for this review, comprising a total of 775 participants (mean age = 32.5 years, 79% female). Therapeutic exercise interventions included both global (e.g., aerobic, core, relaxation, postural) and local jaw-specific (e.g., mobility resistance) exercises. Findings suggest that both jaw-specific and global exercises may improve activity, participation and QOL in patients with TMDs. These findings should be considered with caution as confidence in cumulative evidence was very low. Authors concluded that therapeutic exercise may be effective in improving activity, participation and QOL in individuals with TMDs, although further research is needed to improve the quality of the evidence and to direct clinical guidelines.

Ferrillo et al. (2025) evaluated the efficacy of conservative interventions in pain relief in patients with intracapsular temporomandibular disorders (TMD) in a systematic review and meta-analysis. Out of 3372 papers, 13 RCTs were included, with 844 study participants. Most of them (n = 7) investigated the efficacy of splint appliance. Meta-analysis revealed that rehabilitative interventions had a significant overall effect size of 0.75 [0.17, 1.34], reporting splint appliance and laser therapy as significantly effective treatments. Authors concluded that findings of this systematic review with network meta-analysis suggested that conservative approaches might be effective in pain relief of intracapsular TMD patients.

Ooi et al. (2025) aimed to make evidence-based clinical practice guidelines for the primary treatment of temporomandibular disorders (TMDs) for general practitioners who do not specialize in TMD in a guideline. Randomized controlled trials published between January 2000 and December 2020 were included. Patients diagnosed with TMD according to the Diagnostic Criteria for Temporomandibular Disorders were considered. Myalgia, arthralgia, and maximal mouth opening were selected as outcomes, and 12 treatments were included in the NMA. The modified Delphi method was used to reach a consensus on recommendations during clinical guideline panel meetings of the Japanese Society for the Temporomandibular Joint. Self-administered mouth opening exercises, stabilization-type oral appliances, and low-level laser therapy (LLLT) were recognized as effective primary treatments, although the evidence level was graded as "very low". This guideline recommends mouth opening exercises and the use of stabilization-type oral appliances as primary treatments for TMD. Additionally, it suggests that LLLT be a conditional recommendation, supplemented with additional considerations.

Jogna et al. (2025) provides an integrative overview of current treatments for TMD-associated chronic pain in a narrative review. Pharmacological options discussed include analgesics, muscle relaxants, antidepressants, anticonvulsants, and botulinum toxin injections. Non-pharmacological strategies include physical therapy, cognitive-behavioral therapy, acupuncture, and lifestyle modifications. Authors focused on original research articles, randomized controlled trials, narrative and systematic reviews, and meta-analyses. Effective management of chronic TMD pain requires a multidisciplinary approach tailored to individual needs. Evidence supports the integration of physical and psychological therapies into treatment plans. Future research should aim to develop targeted interventions that address underlying mechanisms of TMD pain and evaluate the long-term outcomes of noninvasive therapies.

Acupuncture

Cho et al. (2010) assessed the effectiveness of acupuncture for the symptomatic treatment of TMD. Nineteen studies were reviewed. There was moderate evidence that classical acupuncture had a positive influence beyond those of placebo (3 trials; 65 participants); had positive effects similar to those of occlusal splint therapy (3 trials; 160 participants); and was more effective for TMD symptoms than physical therapy (4 trials; 397 participants), indomethacin plus vitamin B1 (2 trials; 85 participants), and a wait-list control (3 trials; 138 participants). Only 2 RCTs addressed adverse events and reported no serious adverse events. This review concluded that there is moderate evidence that acupuncture is an effective intervention to reduce symptoms associated with TMD.

Jung et al. (2011) carried out a systematic review and meta-analysis of randomized, placebo-controlled trials assessing the efficacy of acupuncture for treatment of TMD. A total of 7 RCTs met the appropriate inclusion criteria for the purpose of this review. The review and meta-analysis concluded that the evidence for acupuncture as a symptomatic treatment of TMD is limited.

La Touche et al. (2010) carried out a systematic review and meta-analysis of randomized controlled trials for the use of acupuncture treatment. A total of 4 RCTs were considered acceptable. These 4 studies showed positive results such as reducing pain, improving masticatory function, and increasing maximum interincisal opening. The results of this meta-analysis suggest that acupuncture is a reasonable adjunctive treatment for producing a short-term analgesic effect in patients with painful TMD symptoms. As a caveat, although the results described are positive, the relevance of these results was limited by the fact that the meta-analysis was carried out on a total of only 4 studies, representing a relatively small global size (*n*=96), which makes it more difficult to detect a sample bias. Two of the systematic reviews (Jung; La Touche) identified essentially the same set of clinical trials. All trials were very small, sample sizes ranging from only 10 to 20 subjects per treatment group. The Cho review was less restrictive in its inclusion criteria and a few larger trials were included. Notwithstanding, the evidence in this domain is limited to pilot-study-size clinical trials.

Fernandes et al. (2017) sought to determine the effectiveness of acupuncture in treating myofascial pain in temporomandibular disorder (TMD) patients in a systematic review. A total of 4 randomized clinical trials using acupuncture (traditional, trigger point, and laser) for TMD treatment met the eligibility criteria and were included. Although the studies featured small sample sizes and short-term follow-up periods, acupuncture yielded results similar to those observed in groups treated with occlusal splints and were significantly superior to those obtained from placebo acupuncture-treated groups. Authors concluded that despite the weak scientific evidence supporting its efficacy, acupuncture treatment appears to relieve the signs and symptoms of pain in myofascial TMD. More controlled and randomized clinical trials with larger sample sizes are needed.

A network meta-analysis (NMA) of RCTs was performed by Al-Moraissi et al. (2020) aiming to compare the treatment outcome of dry needling, acupuncture or wet needling using different substances in managing myofascial pain of the masticatory muscles (TMD-M). Twenty-one RCTs involving 959 patients were included. The quality of evidence of the included studies was low or very low. There was significant pain decrease after platelet-rich plasma (PRP) when compared to an active/passive placebo and acupuncture. There was a significant improvement of MMO after LA and dry needling therapy versus placebo. The 3 highest ranked treatments for short-term post-treatment pain reduction in TMD-M (1-20 days) were PRP (95.8%), followed by LA (62.5%) and dry needling (57.1%), whereas the 3 highest ranked treatments at intermediate-term follow-up (1-6 months) were LA (90.2%), dry needling (66.1%) and BTX-A (52.1%) (all very low-quality evidence). LA (96.4%) was the most effective treatment regarding the increase in MMO followed by dry needling (72.4%). Authors concluded that based on this NMA the effectiveness of needling therapy did not depend on needling type (dry or wet) or needling substance. The outcome of this NMA suggests that LA, BTX-A, granisetron and PRP hold some promise as injection therapies, but no definite conclusions can be drawn due to the low quality of evidence of the included studies. This NMA did not provide enough support for any of the needling therapies for TMD-M.

Li et al. (2021) discussed the present thinking in the etiology and classification of TMD, followed by the diagnostic approach and the current trend and controversies in management. When focusing on the treatments, this review reports that physiotherapy has been suggested to be an important part in the management of TMD, which may be particularly useful for myalgia or myofascial pain. Understanding the loading of the stomatognathic system, and the existence of any tension and parafunctions, is important in delivering physiotherapy such as muscle training and changing of behavior. Evidence shows that physiotherapy is effective in treatment of TMD, in particular the headache symptoms associated with the condition; future research into this area will further ascertain these findings. For myogenous TMD, Botox injection and dry-needling techniques have been suggested. They note that Botox is not considered a standard treatment option for TMD, while dry-needling, or acupuncture, may be an effective method to reduce tension in some patients. Additionally, initial results regarding extracorporeal shock wave therapy for myogenous TMD appear to show positive results. Authors also note that there has been increasing evidence demonstrating that psychosocial assessment serves as a powerful tool in terms of predicting treatment outcome. For those patients with a significant psychosocial component, counselling seems to be a promising treatment adjunct, which might be most beneficial when included in a multimodal approach. Other conservative treatment options for TMD include stress reduction techniques and diet modification. In the past, a causative relationship between occlusion and TMD had been suggested, but it is now considered an outdated theory not supported by robust evidence, and occlusal adjustment is an irreversible treatment which is no longer supported by the recent literature.

Liu et al. (2021) aimed to use a systematic review and meta-analysis method to understand the efficacy of warm needle acupuncture (WNA) for the treatment of TMD. The meta-analysis included 10 studies with a total of 670 patients, which included 340 patients in the experimental group and 330 patients in the control group. The data in this review showed that WNA is superior to treatments such as acupuncture alone, acupuncture therapy combined with TDP, drug therapy, and ultrasonic therapy in terms of effective rate and cure rate for the treatment of TMD. Authors concluded that this systematic review and meta-analysis provides new evidence for the effectiveness of WNA for the treatment of TMD. However, the above conclusions need to be further verified by multicenter prospective studies of larger samples and higher-quality RCTs.

Park et al. (2023) aimed to assess the effectiveness and safety of acupuncture for TMD via a systematic review of randomized clinical trials. The qualitative analysis of randomized clinical trials with acupuncture as the intervention included 32 articles, 22 of which were included in the quantitative analysis (471 participants). Acupuncture significantly improved outcomes versus active controls. In the analysis of add-ons, acupuncture significantly improved the effect rate and pain intensity. However, the quality of evidence was determined to range from low to very low. Acupuncture in TMD significantly improved outcomes versus active controls and when add-on treatments were applied. However, as the quality of evidence was determined to be low, well-designed clinical trials should be conducted in the future.

Peixoto et al. (2023) evaluated current studies to establish and compare the efficacy of traditional and laser acupuncture in reducing the signs and symptoms of temporomandibular disorders (TMD). Six studies that evaluated the intensity of pain and the level of mouth opening of the patients submitted to acupuncture were selected, and all showed improvement. However, similar results were also observed in the groups treated with occlusal splint and placebo acupuncture. Only 1 study evaluated laser acupuncture and showed a higher proportion of patients with remission of symptoms in the experimental group. Authors concluded that the traditional acupuncture seems to relieve the signs and symptoms of TMD, as well as laser acupuncture when associated with occlusal splint. However, more rigorous, and high-quality clinical trials are needed.

Di Francisco et al. (2024) performed a qualitative and quantitative analysis of the scientific literature regarding the use of acupuncture and laser acupuncture in the treatment of pain associated with temporomandibular disorders (TMDs). The aim of this article was to assess the clinical evidence for acupuncture and laser acupuncture therapies as treatment for temporomandibular joint disorder (TMD). This systematic review includes randomized clinical trials (RCTs) of acupuncture and laser acupuncture as a treatment for TMD compared to other treatments. A total of 11 RCTs met inclusion criteria. The findings show that acupuncture is short-term helpful for reducing the severity of TMD pain with muscle origin. Meta-analysis revealed that the acupuncture group and laser acupuncture group had a higher efficacy rate than the placebo control group, showing a high efficacy of acupuncture and laser acupuncture group in the treatment of temporomandibular. In conclusion, this systematic review demonstrated that the evidence for acupuncture as a symptomatic treatment of TMD is limited. Further rigorous studies are required to establish whether acupuncture has therapeutic value.

Mohamad et al. (2024) determined the effectiveness of different types of acupuncture in reducing pain, improving maximum mouth opening and jaw functions in adults with orofacial pain. Among 52 studies, 86.5% (n = 45) exhibited high risk of bias. Common acupoints, including Hegu LI 4, Jiache ST 6, and Xiaguan ST 7, were used primarily for patients with temporomandibular disorder. Meta-analyses indicated that acupuncture significantly reduced pain intensity in individuals with myogenous TMD, reduced tenderness in the medial pterygoid muscle and jaw dysfunction in mixed TMD when compared to sham/no treatment. However, the overall certainty of the evidence was very low for all outcomes as evaluated by GRADE. The overall results in this review should be interpreted with caution as there was a high risk of bias across the majority of randomized controlled trial (RCTs), and the overall certainty of the evidence was very low. Therefore, future studies with high-quality RCTs are warranted evaluating the use of acupuncture in patients with orofacial pain.

Schiller et al. (2024) examined the effects of acupuncture and therapeutic exercise alone and in combination on temporomandibular joint symptoms in tension-type headache and to evaluate the potential interaction of existing temporomandibular dysfunction on the success of headache treatment. Ninety-six participants with frequent episodic or chronic tension-type headaches were randomized to one of four treatment groups receiving six weeks of acupuncture or therapeutic exercise either as monotherapies or in combination, or usual care. Follow-up was done at 3 and 6 months. Subjective temporomandibular dysfunction symptoms were measured using the Functional Questionnaire Masticatory Organ, and the influence of this sum score and objective initial dental examination on the efficacy of headache treatment interventions was analyzed. Temporomandibular dysfunction score improved in all intervention groups at 3-month follow-up. After 6 months, only acupuncture showed a significant improvement compared to the usual care group. Subjective temporomandibular dysfunction symptoms had no overall influence on headache treatment. Authors report that only acupuncture had long-lasting positive effects on the symptoms of temporomandibular dysfunction. Significant dental findings seem to inhibit the efficacy of acupuncture for tension-type headache.

Mota et al. (2024) assessed the effectiveness of laser acupuncture (LA) on pain intensity and maximum mouth opening range (MMO) related to TMD. Five studies evaluated pain intensity, four with a high risk of bias and one with a low risk. Two studies evaluated pain intensity on palpation (one with high and one with low risk of bias), and one study with high risk of bias evaluated MMO. Laser parameters were: 690-810 nm, 40-150 mW, and 7.5-112.5 J/cm2. Occlusal splint (OS) and Physiotherapy (PT) reduced pain intensity compared to control. The ranking of treatments in order of effectiveness was PT > OS > LA > C > CR (craniopuncture). The certainty of the evidence was very low or low. The data do not support the indication of LA for the treatment of TMDs and new placebo-controlled RCTs must be conducted to demonstrate its effectiveness more precisely.

PRACTITIONER SCOPE AND TRAINING

Practitioners should practice only in the areas in which they are competent based on their education training and experience. Levels of education, experience, and proficiency may vary among individual practitioners. It is ethically and legally incumbent on a practitioner to determine where they have the knowledge and skills necessary to perform such services.

It is best practice for the practitioner to appropriately render services to a patient only if they are trained, equally skilled, and adequately competent to deliver a service compared to others trained to perform the same procedure. If the service would be most competently delivered by another health care practitioner who has more skill and expert training, it would be best practice to refer the patient to the more expert practitioner.

Best practice can be defined as a clinical, scientific, or professional technique, method, or process that is typically evidence-based and consensus driven and is recognized by a majority of professionals in a particular field as more effective at delivering a particular outcome than any other practice (Joint Commission International Accreditation Standards for Hospitals, 2020).

Depending on the practitioner's scope of practice, training, and experience, a member's condition and/or symptoms during examination or the course of treatment may indicate the need for referral to another practitioner or even emergency care. In such cases it is prudent for the practitioner to refer the member for appropriate co-management (e.g., to their primary care physician) or if immediate emergency care is warranted, to contact 911 as appropriate. See the *Managing Medical Emergencies (CPG 159 – S)* clinical practice guideline for information.

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