

As part of the mission of the TMJ Patient Led RoundTable, Working Group 1 wanted to learn the status of science underlying therapies used to treat Temporomandibular Disorders (TMD). To establish the current state of TMD treatments and the strength of data supporting them, a literature search was conducted to identify meta-analyses and systematic reviews on the subject. Ninety-four (94) articles were identified and abstracts of these articles are contained on pages 2-28 on this document.

The following broad summary identifies shortcomings and suggests research opportunities for improving the quality and rigor of clinical studies on TMD treatments.

Topic #1: TMD Definition / Cohort Heterogeneity

<u>Findings:</u>	There is a general lack of consensus across studies as the definition of TMD. Some trials utilized RDC/TMD or DC/TMD to select subjects, but many did not.
<u>Research Recommendations:</u>	There is a need to develop improved patient diagnostic criteria and appropriate methodology for patient selection in TMD trials, such that the complexity of TMD as a multi-system illness is taken into account. Additional criteria beyond RDC/TMD Axes I and II or DC/TMD should be incorporated, including, but not limited to: genetics; other 'omics'; and chronic overlapping pain conditions and non-pain conditions (e.g., cardiovascular, neurological, endocrinological, connective tissue, gynecological, immunological).

Topic #2: Data Quality

<u>Findings:</u>	In general, data quality is low. Issues include small sample sizes; high risk of bias; lack of randomization; and lack of blinding. Although there is a large literature base reporting on the efficacy of TMD treatments, most of it is not at the level of a Randomized Control Trial.
<u>Research Recommendations:</u>	Enhanced rigor in clinical trial design is urgently needed. Best practices should be established to include clinical trialists in the design of future TMD treatment studies.

Topic #3: Patient Reported Outcomes

<u>Findings:</u>	In general, measured outcomes focused on pain reduction, improvement in jaw range of motion and improved oral function. Few studies included patient reported outcomes, including quality of life measures and activities of daily living.
<u>Research Recommendations:</u>	Develop improved outcome measures that focus on patient-reported measures of improvement in quality of life, etc. In addition, TMD patients should be included in this effort.

Topic 4: Treatment Approaches

<u>Findings:</u>	Most studies include a single approach to treating TMDs. It is likely that multiple, simultaneous treatments will be most effective for the majority of TMD patients.
<u>Research Recommendations:</u>	Design and conduct pragmatic and other types of clinical trials that investigate real-world treatment approaches in a scientifically rigorous manner.

[Is nonsurgical management effective in temporomandibular joint disorders? - A systematic review and meta-analysis.](#)

Nandhini J, Ramasamy S, Ramya K, Kaul RN, Felix AJW, Austin RD.
Dent Res J (Isfahan). 2018 Jul-Aug;15(4):231-241.

BACKGROUND: Various nonsurgical interventions have been used for the management of patients with temporomandibular joint (TMJ) disorders, but their clinical effectiveness remains unclear. Hence, the purpose of this systematic review and meta-analyses was to assess the evidence of the effectiveness of nonsurgical interventions in the management of TMJ disorders. **MATERIALS AND METHODS:** A literature search on five databases such as PubMed, PubMed Central Cochrane, TRIP, NGCH databases and hand searching was conducted for a period from October 1995 to 2015. Randomized control trials (RCTs) on the nonsurgical management of TMJ disorders were included and reported in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. The quality of the articles was assessed by JADAD scoring. Finally, out of 23 RCTs, 11 articles having any of the primary outcomes (pain pressure threshold [PPT], pain, maximal pain-free mouth opening, and level of dysfunction) were selected. The extracted data were analyzed using NCSS software. **RESULTS:** The results showed the evidence of pain reduction ($P = 0.00$), maximal pain-free mouth opening ($P = 0.0138$), and decrease in level of dysfunction ($P = 0.0007$) but no improvement in PPT to a significant level ($P = 0.6600$). **CONCLUSION:** Our results suggest that the simplest, cost-effective nonsurgical treatments have a positive therapeutic effect on the initial management of TMJ disorders. However, a consistent methodology recording both the objective and subjective outcomes would be a better choice for added reliability.

[Outcomes of therapeutic TMD interventions on oral health related quality of life: A qualitative systematic review.](#)

Song YL, Yap AU.
Quintessence Int. 2018;49(6):487-496. doi: 10.3290/j.qi.a40340.

OBJECTIVES: This systematic review aims to determine the impact of temporomandibular disorder (TMD) therapeutic interventions on patients' oral health related quality of life (OHRQoL) and to recommend approaches that improve QoL. **DATA SOURCES:** A systematic search of the literature was performed between January 2007 and October 2017 to identify articles on TMD interventions and OHRQoL. Randomized controlled trials, and retrospective and prospective cohort studies that mentioned dedicated tools for measurement of OHRQoL changes in TMD patients after therapeutic interventions were included. Abstracts of studies that did not mention any form of measurement of OHRQoL in their treatment outcome were excluded. The initial screening yielded 171 articles. After evaluation of abstracts and full text articles, five articles fulfilled all selection criteria and were included. Most TMD treatment interventions seem to improve QoL to some extent, but no single treatment modality can be advocated as the sole approach to managing TMD. **CONCLUSION:** Psychotherapy, occlusal appliance therapy, arthrocentesis, and orthodontics/orthognathic surgery (in subjects with severe malocclusion) appear to improve OHRQoL of TMD patients. Recommendation on the best TMD intervention for improving QoL could not be made due to the diverse TMD subtypes and non-disease specific OHRQoL instruments employed. More studies incorporating TMD-specific OHRQoL measures and targeting explicit TMD subtypes based on internationally accepted diagnostic criteria are warranted in this area of research.

[Effect of temporomandibular disorder therapy on otologic signs and symptoms: a systematic review.](#)

Stechman-Neto J, Porporatti AL, Porto de Toledo I, Costa YM, Conti PC, De Luca Canto G, Mezzomo LA.
J Oral Rehabil. 2016 Jun;43(6):468-79. doi: 10.1111/joor.12380.

The most common temporomandibular disorders (TMD) signs and symptoms are related to muscle sensitivity through palpation, restricted mouth opening, asymmetric mandibular movements, joint sounds, pain and otologic signs and symptoms. To date, counselling, occlusal splints, exercises, biofeedback and acupuncture are examples of conservative modalities proposed for TMD therapy. The aim of this systematic review was to investigate the effect of these conservative therapies for TMD on otologic signs and symptoms. The authors searched the following electronic databases published up to 1st May 2015: PubMed, LILACS, Scopus, Web of Science and Science Direct with no time or language limitations. Using a two-phase selection process, the authors identified 08 articles and used them to conduct a qualitative analysis. Methodological quality of each article was performed with the aid of 'Quality Assessment of a Cohort Study' and 'Quality Assessment of a Randomized Clinical Trial', developed by the Dutch Cochrane Centre, a centre of the Cochrane Collaboration. This systematic review showed in seven of the eight studies included that a total or partial resolution of otologic complains occurred after counselling, exercise therapies and occlusal splint therapy. Upon the limitations of the studies included in this systematic review, the present outcomes suggested that there is insufficient evidence in favour or against the conservative therapies for TMD on changes in otologic signs and symptoms. Thus, further studies with a higher level of evidence and more representative samples should be conducted to better understand the relationship of TMD therapy changes on otologic complains.

[Management of TMD: Evidence from systematic reviews and meta-analyses.](#)

List T, Axelsson S.
J Oral Rehabil. 2010 May;37(6):430-51. doi: 10.1111/j.1365-2842.2010.02089.x.

This systematic review (SR) synthesises recent evidence and assesses the methodological quality of published SRs in the management of temporomandibular disorders (TMD). A systematic literature search was conducted in the PubMed, Cochrane Library, and Bandolier databases for 1987 to September 2009. Two investigators evaluated the methodological quality of each identified SR using two measurement tools: the assessment of multiple systematic reviews (AMSTAR) and level of research design scoring. Thirty-eight SRs met inclusion criteria and 30 were analysed: 23 qualitative SRs and seven meta-analyses. Ten SRs were related to occlusal appliances, occlusal adjustment or bruxism; eight to physical therapy; seven to pharmacologic treatment; four to TMJ and maxillofacial surgery; and six to behavioural therapy and multimodal treatment. The median

AMSTAR score was 6 (range 2-11). Eighteen of the SRs were based on randomised clinical trials (RCTs), three were based on case-control studies, and nine were a mix of RCTs and case series. Most SRs had pain and clinical measures as primary outcome variables, while few SRs reported psychological status, daily activities, or quality of life. There is some evidence that the following can be effective in alleviating TMD pain: occlusal appliances, acupuncture, behavioural therapy, jaw exercises, postural training, and some pharmacological treatments. Evidence for the effect of electrophysical modalities and surgery is insufficient, and occlusal adjustment seems to have no effect. One limitation of most of the reviewed SRs was that the considerable variation in methodology between the primary studies made definitive conclusions impossible.

[Is there a superiority of multimodal as opposed to simple therapy in patients with temporomandibular disorders? A qualitative systematic review of the literature.](#)

Türp JC, Jokstad A, Motschall E, Schindler HJ, Windecker-Gétaz I, Ettl DA.

Clin Oral Implants Res. 2007 Jun;18 Suppl 3:138-50.

Erratum in: Clin Oral Implants Res. 2008 Mar;19(3):326-8.

BACKGROUND: Pain is the most common motivation for patients with temporomandibular disorders (TMDs) to seek care. Therapeutic options range from patient education to joint surgery. **OBJECTIVES:** To conduct a systematic review of articles reporting on simple and multimodal management strategies in TMD patients. 'Simple therapy' was defined as care provided by a dentist, without using technical dental interventions, whereas 'multimodal' refers to at least two different modalities. We followed the null hypothesis of no difference between these two approaches. **MATERIAL AND METHODS:** A systematic search was carried out in the following databases: Ovid Medline (1966-2006), Cochrane Library (Issue 3/2006), and Science Citation Index (1945-2006). Subsequently, the reference lists of the identified articles were searched to find additional pertinent publications. We divided the study reports according to the main presenting symptom: (1) disc displacement without reduction, with pain; (2) TMD pain, without major psychological symptoms; and (3) TMD pain, with major psychological symptoms. **RESULTS:** Eleven articles representing nine different clinical studies were identified. (1) In the disc displacement group with pain, multimodal therapy was not superior to explanation and advice. (2) A combination of occlusal appliance and biofeedback-assisted relaxation/stress management was not significantly superior to either of these therapies after 6 months. Furthermore, brief information alone or combined with relaxation training or occlusal appliance, respectively, were equally efficacious at the 6-month follow-up. There was no superiority of multimodal therapy including splints as compared with simple care. A slightly better outcome was reported for a combination of education and home physical therapy regimen than for patient education alone. (3) In temporomandibular pain patients with major psychological disturbances, patients benefited more from a combined therapeutic approach compared with simple care. **CONCLUSION:** Current research suggests that individuals without major psychological symptoms do not require more than simple therapy. In contrast, patients with major psychological involvement need multimodal, interdisciplinary therapeutic strategies. The clinician's acceptance of the importance of psychological factors in TMD pain forms the platform for convincingly educating patients about the need for multimodal management.

Abstracts: Pharmacotherapy

[Pharmacological treatment of oro-facial pain - health technology assessment including a systematic review with network meta-analysis.](#)

Haggman-Henrikson B, Alstergren P, Davidson T, Hogestatt ED, Ostlund P, Tranaeus S, Vitols S, List T.

J Oral Rehabil. 2017 Oct;44(10):800-826. doi: 10.1111/joor.12539.

This health technology assessment evaluated the efficacy of pharmacological treatment in patients with oro-facial pain. Randomised controlled trials were included if they reported pharmacological treatment in patients ≥ 18 years with chronic (≥ 3 months) oro-facial pain. Patients were divided into subgroups: TMD-muscle [temporomandibular disorders (TMD) mainly associated with myalgia]; TMD-joint (TMD mainly associated with temporomandibular joint pain); and burning mouth syndrome (BMS). The primary outcome was pain intensity reduction after pharmacological treatment. The scientific quality of the evidence was rated according to GRADE. An electronic search in PubMed, Cochrane Library, and EMBASE from database inception to 1 March 2017 combined with a hand search identified 1552 articles. After screening of abstracts, 178 articles were reviewed in full text and 57 studies met the inclusion criteria. After risk of bias assessment, 41 articles remained: 15 studies on 790 patients classified as TMD-joint, nine on 375 patients classified as TMD-muscle and 17 on 868 patients with BMS. Of these, eight studies on TMD-muscle, and five on BMS were included in separate network meta-analysis. The narrative synthesis suggests that NSAIDs as well as corticosteroid and hyaluronate injections are effective treatments for TMD-joint pain. The network meta-analysis showed that clonazepam and capsaicin reduced pain intensity in BMS, and the muscle relaxant cyclobenzaprine, for the TMD-muscle group. In conclusion, based on a limited number of studies, evidence provided with network meta-analysis showed that clonazepam and capsaicin are effective in treatment of BMS and that the muscle relaxant cyclobenzaprine has a positive treatment effect for TMD-muscle pain.

[Combined palliative and anti-inflammatory medications as treatment of temporomandibular joint disc displacement without reduction: a systematic review.](#)

Januzzi E, Nasri-Heir C, Grossmann E, Leite FM, Heir GM, Melnik T.

Cranio. 2013 Jul;31(3):211-25.

The aim of this study was to evaluate the efficacy of self-care combined with anti-inflammatory medications in the treatment of temporomandibular joint (TMJ) pain associated with disc displacement without reduction (DDWOR). A systematic review of randomized clinical trials was done by the authors. The databases searched were Medline (1966 to July 2012); EMBASE (1980 to July 2012); and LILACS (from 1982 to July 2012). The review authors independently assessed trials for eligibility and methodological quality and also extracted all data. The data was double-checked for accuracy.

There was no language restriction in the searches of EMBASE, PubMed, and LILACS databases, or in the manual search. The risk of bias and the heterogeneity of the studies taken into consideration were assessed. Two studies, randomizing 175 patients, were included in this review. The first study (n = 106) compared the following interventions: medical treatment, rehabilitation, arthroscopic surgery with postoperative rehabilitation, or arthroplastic surgery with post-operative rehabilitation. The second study (n = 69) compared the use of nonsteroidal anti-inflammatory medications and self-care instructions, nonsteroidal anti-inflammatory medications, occlusal splint, and mobilization therapy. The third group received no treatment; patients were only informed of their prognosis. There is no sufficient evidence regarding efficacy and safety of the palliative treatments associated with anti-inflammatory versus other treatments, or absence of treatment on pain reduction in patients with TMJ DDWOR.

[Pharmacological interventions for pain in patients with temporomandibular disorders.](#)

Mujakperuo HR, Watson M, Morrison R, Macfarlane TV.

Cochrane Database Syst Rev. 2010 Oct 6;(10):CD004715. doi: 10.1002/14651858.CD004715.pub2.

BACKGROUND: Temporomandibular disorders (TMD) are a group of disorders affecting the temporomandibular joints and the muscles of mastication. TMDs are treated with a wide range of drugs. The extent to which the use of these drugs is based upon evidence is unknown. **OBJECTIVES:** To assess the effectiveness of pharmacological interventions both alone and in combination with non-pharmacological therapy in relieving pain in patients with chronic TMD. **SEARCH STRATEGY:** Electronic searches of the Cochrane Oral Health Group's Trials Register (2 August 2010), CENTRAL (The Cochrane Library 2010, Issue 3), MEDLINE via OVID (1950 to 2 August 2010), EMBASE via OVID (1980 to 2 August 2010) and CINAHL via EBSCO (1981 to 2 August 2010) were conducted. Reference lists of articles and previous reviews were scanned for relevant articles and authors were contacted for further information where appropriate. **SELECTION CRITERIA:** Randomised controlled trials (RCTs) in which a pharmacological agent was compared with placebo for the management of pain in patients with TMD. Parenteral routes of administration were excluded. **DATA COLLECTION AND ANALYSIS:** Duplicate data extraction and assessment of risk of bias in included studies was performed. **MAIN RESULTS:** Eleven studies were included with a total of 496 participants. The primary outcome of most of the studies was pain. The risk of bias in the included studies was variable. Whilst four studies showed significant pain relief for the active treatment, three were of poor quality. Most adverse effects were mild to moderate in severity. Four studies reported withdrawals due to severe adverse reactions, but insufficient information was provided regarding the trial groups from which the withdrawals occurred. No meta-analysis was conducted due to lack of similarities across the included studies. **AUTHORS' CONCLUSIONS:** There is insufficient evidence to support or not support the effectiveness of the reported drugs for the management of pain due to TMD. There is a need for high quality RCTs to derive evidence of the effectiveness of pharmacological interventions to treat pain associated with TMD.

[The use of tricyclic antidepressants in the treatment of temporomandibular joint disorders: systematic review of the literature of the last 20 years.](#)

Cascos-Romero J, Vazquez-Delgado E, Vazquez-Rodriguez E, Gay-Escoda C.

Med Oral Patol Oral Cir Bucal. 2009 Jan 1;14(1):E3-7.

Many therapies have been proposed for the management of temporomandibular disorders, including the use of different drugs. However, lack of knowledge about the mechanisms behind the pain associated with this pathology, and the fact that the studies carried out so far use highly disparate patient selection criteria, mean that results on the effectiveness of the different medications are inconclusive. This study makes a systematic review of the literature published on the use of tricyclic antidepressants for the treatment of temporomandibular disorders, using the SORT criteria (Strength of recommendation taxonomy) to consider the level of scientific evidence of the different studies. Following analysis of the articles, and in function of their scientific quality, a type B recommendation is given in favor of the use of tricyclic antidepressants for the treatment of temporomandibular disorders.

[In patients with temporomandibular disorders, do particular interventions influence oral health-related quality of life? A qualitative systematic review of the literature.](#)

Turp JC, Motschall E, Schindler HJ, Heydecke G.

Clin Oral Implants Res. 2007 Jun;18 Suppl 3:127-37.

Erratum in: Clin Oral Implants Res. 2008 Mar;19(3):326-8.

OBJECTIVES: The use of patient-based outcomes to measure therapeutic effectiveness is increasing, because a growing number of clinical scientists are attempting to evaluate the impact of therapy on the recipient. There are indications that patients suffering from temporomandibular disorders (TMDs) may also show a reduced oral health-related quality of life (OHQoL). It was the purpose of this paper to answer the question as to whether therapeutic interventions in TMD patients have a positive effect on their OHQoL. **MATERIAL AND METHODS:** A systematic electronic search (Ovid Medline 1966-2006; Science Citation Index 1945-2006) of the literature was carried out to identify pertinent articles of randomized and non-randomized clinical trials. Reports on retrospective and prospective studies that specifically focused on OHQoL changes in TMD patients as a consequence of therapeutic interventions were included. The reference lists of the identified articles were screened to find additional pertinent publications. **RESULTS:** The investigation yielded seven relevant contributions from Medline. A quantitative analysis of the seven identified articles was not possible. There was considerable heterogeneity among the investigations with regard to study design, patient characteristics, and provided therapy. Three of the identified articles reported about prospective controlled studies, of which one was an RCT. Four additional investigations were retrospective. According to the results of the only RCT, a 6-week course of the non-selective cyclooxygenase (COX) inhibitor naproxen may lead to slightly better OHQoL in patients with temporomandibular joint (TMJ) arthralgia than the selective COX-2 inhibitor celecoxib. The two other articles reporting of a controlled study showed that selective serotonin uptake inhibitors accompanied by psychological therapy improved OHQoL in individuals with TMJ arthralgia. In contrast, TMJ surgery did not improve OHQoL. **CONCLUSION:** It appears that all therapeutic interventions reported in the identified publications led to at least some improvement of OHQoL. The only exception were patients with multiple TMJ surgeries.

[Pharmacologic interventions in the treatment of temporomandibular disorders, atypical facial pain, and burning mouth syndrome. A qualitative systematic review.](#)

List T, Axelsson S, Leijon G.
J Orofac Pain. 2003 Fall;17(4):301-10.

AIMS: To carry out a systematic review of the literature in order to assess the pain-relieving effect and safety of pharmacologic interventions in the treatment of chronic temporomandibular disorders (TMD), including rheumatoid arthritis (RA), as well as atypical facial pain (AFP), and burning mouth syndrome (BMS). METHODS: Study selection was based on randomized clinical trials (RCTs). Inclusion criteria included studies on adult patients (> or = 18 years) with TMD, RA of the temporomandibular joint (TMJ), AFP, or BMS and a pain duration of > 3 months. Data sources included Medline, Cochrane Library, Embase, and Psych Litt. RESULTS: Eleven studies with a total of 368 patients met the inclusion criteria. Four trials were on TMD patients, 2 on AFP, 1 on BMS, 1 on RA of the TMJ, and 3 on mixed groups of patients with TMD and AFP. Of the latter, amitriptyline was effective in 1 study and benzodiazepine in 2 studies; the effect in 1 of the benzodiazepine studies was improved when ibuprofen was also given. One study showed that intra-articular injection with glucocorticoid relieved the pain of RA of the TMJ. In 1 study, a combination of paracetamol, codeine, and doxylamine was effective in reducing TMD pain. No effective pharmacologic treatment was found for BMS. Only minor adverse effects were reported in the studies. CONCLUSION: The common use of analgesics in TMD, AFP, and BMS is not supported by scientific evidence. More large RCTs are needed to determine which pharmacologic interventions are effective in TMD, AFP, and BMS.

[\[Pharmacotherapy of orofacial pain\].](#) [Article in German]

Sommer C.
Schmerz. 2002 Sep;16(5):381-8.

OBJECTIVES: Pharmacotherapy of chronic orofacial pain is unsatisfactory. Here we set out to prepare a systematic review of randomized controlled clinical trials (RCTs) on pharmacotherapy of facial pain. METHODS: The diagnostic groups "temporomandibular disorders" (TMDs), "atypical facial pain", and "trigeminal neuralgia" were included. RCTs published between 1966 and August 2001 were identified by Medline search, from review articles, and from the Cochrane and Bandolier databases. The quality of the trials was judged according to established criteria. Good or excellent pain reduction or >50% pain reduction were used as endpoints for successful treatment. Numbers needed to treat (NNTs) and their 95% confidence intervals were calculated where dichotomous data were available. RESULTS: Twelve studies were identified for the TMDs, 11 for trigeminal neuralgia, four for atypical facial pain. Many studies had methodological problems and small numbers of patients. There was sufficient evidence of efficacy of carbamazepin in trigeminal neuralgia, also for baclofen and lamotrigine. In the TMD studies, there was evidence of a moderate effect of muscle relaxants/tranquilizers. Two studies of atypical facial pain showed a moderate effect of antidepressants. CONCLUSIONS: Apart from studies in trigeminal neuralgia, there is little evidence of efficacy of pharmacotherapy in orofacial pain. High quality studies with sufficient numbers of patients using operational definitions of disease entities are warranted.

Abstracts: Acupuncture

[Acupuncture in temporomandibular disorder myofascial pain treatment: A systematic review.](#)

Fernandes AC, Duarte Moura DM, Da Silva LGD, De Almeida EO, Barbosa GAS.
J Oral Facial Pain Headache. 2017 Summer;31(3):225-232. doi: 10.11607/ofph.1719.

AIMS: To carry out a systematic review of clinical trials published up to 2015 to determine the effectiveness of acupuncture in treating myofascial pain in temporomandibular disorder (TMD) patients. METHODS: The databases used were the Cochrane Library, PubMed, Scopus, and Web of Science; the dates of the articles surveyed ranged from 1990 to May 2015. The inclusion criteria were: (1) publications in English, Portuguese, or Spanish; (2) controlled clinical trials; (3) patients with TMD of muscular origin; and (4) studies that used acupuncture or laser acupuncture only for treatment. Reference lists of the included articles were hand searched. RESULTS: A total of four 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 than those obtained from placebo acupuncture-treated groups. CONCLUSION: 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 in this field of research to verify these initial findings.

[Acupuncture therapy in the management of the clinical outcomes for temporomandibular disorders: A PRISMA-compliant meta-analysis.](#)

Wu JY, Zhang C, Xu YP, Yu YY, Peng L, Leng WD, Niu YM, Deng MH.
Medicine (Baltimore). 2017 Mar;96(9):e6064. doi: 10.1097/MD.0000000000006064.

PURPOSE: The purpose of this study was to evaluate conventional acupuncture therapy in the management of clinical outcomes for temporomandibular disorders (TMD) in adults. METHODS: The electronic databases PubMed, EMBASE, Cochrane Central Register of Controlled Trials, and Clinical Trials.gov were searched for reports published until March 31, 2016. RESULTS: Nine eligible studies from 8 publications involving 231 patients were included in the meta-analysis. A comparison of the main outcome of visual analog scale (VAS) values of pain between the acupuncture group and control group showed a significant decrease (MD = -0.98, 95% CI [-1.62, -0.34], I=54%, P=0.003) in the VAS following acupuncture treatment. However, subgroup analysis according to the type of sham control group indicated that there were significant differences in the results when sham acupuncture was used as the control group (MD = -1.54, 95% CI [-2.63, -0.45], I=58%, P=0.006) as well as when sham laser treatment was used as the control group (MD = -1.29, 95% CI [-2.32, -0.27], I = 0%, P = 0.01). However, there was no significant difference when

the splint treatment group was used as the control group (MD = -0.09, 95% CI [-0.69, 0.50], I = 0%, P = 0.76). Subgroup analyses of VAS for pain by the classification of diseases indicated that the myogenous TMD subgroup demonstrated a significant difference (MD = -1.49, 95% CI [-2.45, -0.53], I = 47%, P = 0.002), and TMD showed no statistically significant difference (MD = -0.42, 95% CI [-1.14, 0.30], I = 46%, P = 0.25). Subgroup analysis according to whether the subgroup penetrated the skin showed that nonpenetrating sham acupuncture as the control group showed a significant difference (MD = -1.56, 95% CI [-2.70, -0.41], I = 58%, P = 0.008) compared with the conventional acupuncture as the treatment modality, while penetrating sham acupuncture as the control group showed no significant difference (MD = -1.29, 95% CI [-3.40, 0.82], I = not applicable, P = 0.23). No publication bias was observed considering the symmetry of the funnel plots. CONCLUSIONS: Our results indicate that conventional acupuncture therapy is effective in reducing the degree of pain in patients with TMD, especially those with myofascial pain symptoms.

[Acupuncture for treating temporomandibular joint disorders: a systematic review and meta-analysis of randomized, sham-controlled trials.](#)

Jung A, Shin BC, Lee MS, Sim H, Ernst E.

J Dent. 2011 May;39(5):341-50. doi: 10.1016/j.jdent.2011.02.006.

OBJECTIVE: The aim of this article was to assess the clinical evidence for or against acupuncture and acupuncture-like therapies as treatments for temporomandibular joint disorder (TMD). DATA: This systematic review includes randomized clinical trials (RCTs) of acupuncture as a treatment for TMD compared to sham acupuncture. The search terms were selected according to medical subject heading (MeSH). SOURCES: Systematic searches were conducted in 13 electronic databases up to July 2010; Medline, PubMed, The Cochrane Library 2010 (Issue 7), CINAHL, EMBASE, seven Korean Medical Databases and a Chinese Medical Database. STUDY SELECTION: All parallel or cross-over RCTs of acupuncture for TMD were searched without language restrictions. Studies in which no clinical data and complex interventions were excluded. Finally, total of 7 RCTs met our inclusion criteria. CONCLUSIONS: In conclusion, our systematic review and meta-analysis demonstrate that the evidence for acupuncture as a symptomatic treatment of TMD is limited. Further rigorous studies are, however, required to establish beyond doubt whether acupuncture has therapeutic value for this indication.

[Acupuncture for temporomandibular disorders: a systematic review.](#)

Cho SH, Whang WW.

J Orofac Pain. 2010 Spring;24(2):152-62.

AIMS: To assess the effectiveness of acupuncture for the symptomatic treatment of temporomandibular disorders (TMD) from a review of studies using randomized controlled trials (RCTs). METHODS: Electronic databases were systematically searched for articles reporting RCTs investigating acupuncture for TMD. The methodological qualities of eligible studies were assessed using the criteria described in the Cochrane Handbook. RESULTS: Nineteen reports were systematically reviewed. There was moderate evidence that classical acupuncture had a positive influence beyond those of placebo (three trials, 65 participants); had positive effects similar to those of occlusal splint therapy (three trials, 160 participants); and was more effective for TMD symptoms than physical therapy (four trials, 397 participants), indomethacin plus vitamin B1 (two trials, 85 participants), and a wait-list control (three trials, 138 participants). Only two RCTs addressed adverse events and reported no serious adverse events. CONCLUSION: This systematic review noted moderate evidence that acupuncture is an effective intervention to reduce symptoms associated with TMD. There is a need for acupuncture trials with adequate sample sizes that address the long-term efficacy or effectiveness of acupuncture.

[Effectiveness of acupuncture in the treatment of temporomandibular disorders of muscular origin: a systematic review of the last decade.](#)

La Touche R, Angulo-Diaz-Parreno S, de-la-Hoz JL, Fernandez-Carnero J, Ge HY, Linares MT, Mesa J, Sanchez-Gutierrez J.

J Altern Complement Med. 2010 Jan;16(1):107-12. doi: 10.1089/acm.2008.0484.

OBJECTIVE: The purpose of this review is to evaluate the effectiveness of using acupuncture treatment for temporomandibular disorders (TMD) of muscular origin according to research published in the last decade. METHODS: The information was gathered using the MEDLINE, EMBASE, CINAHL, and CISCOR databases. The inclusion criteria for selecting the studies were the following: (1) only randomized controlled trials (RCTs) were selected; (2) studies had to be carried out on patients with TMD of muscular origin; (3) studies had to use acupuncture treatment; and (4) studies had to be published in scientific journals between 1997 and 2008. Two (2) independent reviewers analyzed the methodological quality of the studies using the Delphi list. A total of four RCTs were chosen once the methodological quality was judged as being acceptable. All of the studies included in the review compared the acupuncture treatment with a placebo treatment. All of them described results that were statistically significant in relation to short-term improvement of TMD signs and symptoms of a muscular origin, except one of the analyzed studies that found no significant difference between acupuncture and sham acupuncture. CONCLUSIONS: In the authors' opinion, research into the long-term effects of acupuncture in the treatment of TMD is needed. We also recommend larger samples sizes for future studies, so the results will be more reliable.

[Acupuncture in the treatment of pain in temporomandibular disorders: a systematic review and meta-analysis of randomized controlled trials.](#)

La Touche R, Goddard G, De-la-Hoz JL, Wang K, Paris-Aleman A, Angulo-Diaz-Parreno S, Mesa J, Hernandez M.

Clin J Pain. 2010 Jul-Aug;26(6):541-50. doi: 10.1097/AJP.0b013e3181e2697e.

OBJECTIVES: The aim of this study is to perform a qualitative and quantitative analysis of the scientific literature regarding the use of acupuncture in the treatment of pain associated with temporomandibular disorders (TMDs). METHODS: By using electronic databases, the goal was to search and evaluate all the randomized controlled trials (RCTs) in which acupuncture was used in the management of pain attributed to these clinical entities. For the meta-analysis, an adequate description of the results' statistical data was required along with a comparison of the treatment with a control group using a placebo or sham. Two independent reviewers evaluated the quality of the studies using the Jadad scale. RESULTS: A total of 8 RCTs were selected, and the quality of only 4 was considered acceptable. These 4 studies showed positive results such as reducing pain, improving masticatory function, and increasing maximum interincisal opening. By combining the studies (n=96) and analyzing the results, it was concluded that acupuncture is more effective than placebo in reducing pain intensity in TMD (standardized mean difference 0.83; 95% confidence interval, 0.41-1.25; P=0.00012). DISCUSSION: 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. Although the results described are positive, the relevance of these results was limited by the fact that substantial bias was present. These findings must be confirmed by future RCTs that improve the methodologic deficiencies of the studies evaluated in this.

[Practical recommendations for the use of acupuncture in the treatment of temporomandibular disorders based on the outcome of published controlled studies.](#)

Rosted P.

Oral Dis. 2001 Mar;7(2):109-15.

OBJECTIVE: The objective is to analyse the treatment procedures used in the individual studies to identify any similarities of therapeutic approaches and subsequently present recommendations for a standard acupuncture procedure for the treatment of temporomandibular disorders (TMD). **MATERIALS:** Literature searches performed by the Royal Society of Medicine and the University Library, Copenhagen were able to identify 74 publications regarding the use of acupuncture in dentistry. Among them 14 papers concerned the use of acupuncture in the treatment of TMD. To ensure reasonable methodological soundness of the involved studies, only randomised and blinded studies were included, which reduced the number of papers to six. Among these six papers three concerns the same study and were counted as one. One paper was a follow-up of a previous study and for this purpose counted as one. **METHODS:** All publications were analysed for the following information: acupuncture points used, type of stimulation, number of treatments, duration of the individual treatment and the interval between the individual treatments. **MAIN OUTCOME:** Acupuncture has in three out of three randomised controlled trials (RCT) proved effective for the treatment of TMD. The following local acupuncture points are recommended for the treatment of TMD: ST-6, ST-7, SI-18, GV-20, GB-20, BL-10. As a distant point LI-4 is recommended. After inserting the needles they should be manipulated manually to achieve the De-qui sensation and left in situ for 30 min. Treatment should be given weekly and a total number of six treatments is recommended.

[Acupuncture as a treatment for temporomandibular joint dysfunction: a systematic review of randomized trials.](#)

Ernst E, White AR.

Arch Otolaryngol Head Neck Surg. 1999 Mar;125(3):269-72.

OBJECTIVE: To summarize the data from randomized controlled trials of acupuncture for temporomandibular joint dysfunction. **METHODS:** Four independent computerized literature searches were performed. Only randomized trials were admitted in which acupuncture was tested vs sham acupuncture, standard therapy, or no treatment at all. Data were extracted in a predefined, standardized fashion. **RESULTS:** Six reports met the inclusion and exclusion criteria, representing 3 distinct trials. Overall, their results suggest that acupuncture might be an effective therapy for temporomandibular joint dysfunction. However, none of the studies was designed to control for a placebo effect. **CONCLUSION:** Even though all studies are in accordance with the notion that acupuncture is effective for temporomandibular joint dysfunction, this hypothesis requires confirmation through more rigorous investigations.

Abstracts: Physical, Exercise & Manual Therapy

[The effectiveness of exercise therapy for temporomandibular dysfunction: a systematic review and meta-analysis.](#)

Dickerson SM, Weaver JM, Boyson AN, Thacker JA, Junak AA, Ritzline PD, Donaldson MB.

Clin Rehabil. 2017 Aug;31(8):1039-1048. doi: 10.1177/0269215516672275.

OBJECTIVE: To investigate the effectiveness of exercise therapy on pain, function, and mobility outcomes in patients with temporomandibular joint dysfunction. **STUDY DESIGN:** Systematic review with meta-analysis. **METHODS:** A systematic review and meta-analysis undertaken following Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Studies that met the inclusion criteria: (1) randomized controlled trials; (2) a population with the diagnosis of temporomandibular joint dysfunction; and (3) interventions that included exercise therapy were considered for review. When studies demonstrated homogeneity on outcome measures, the mean differences or standardized mean differences with 95% confidence interval were calculated and pooled in a meta-analysis for pooled synthesis. **RESULTS:** Six articles with a total of 419 participants were included in the review and only four studies were included in the meta-analysis. Mobility and mixed exercise therapy approaches appear to be the most common exercise approaches utilized for management of temporomandibular joint dysfunction. Exercise therapy and the associated dosage provide moderate short-term and varying long-term benefits in reduction of pain and improvement of range of motion of the in patients with temporomandibular joint dysfunction. **CONCLUSION:** Included studies suggest a mobility or a mixed approach to exercise therapies have impact on reducing pain, significant impact for increasing range of motion, but lack a significant impact for functional improvement. **LEVEL OF EVIDENCE:** Therapy, level 1a-

[Effectiveness of manual therapy and therapeutic exercise for temporomandibular disorders: Systematic review and meta-analysis.](#)

Armijo-Olivo S, Pitance L, Singh V, Neto F, Thie N, Michelotti A.

Phys Ther. 2016 Jan;96(1):9-25. doi: 10.2522/ptj.20140548.

BACKGROUND: Manual therapy (MT) and exercise have been extensively used to treat people with musculoskeletal conditions such as temporomandibular disorders (TMD). The evidence regarding their effectiveness provided by early systematic reviews is outdated. **PURPOSE:** The aim of this study was to summarize evidence from and evaluate the methodological quality 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. **DATA SOURCES:** Electronic data searches of 6 databases were performed, in addition to a manual search. **STUDY SELECTION:** Randomized controlled trials

involving adults with TMD that compared any type of MT intervention (eg, mobilization, manipulation) or exercise therapy with a placebo intervention, controlled comparison intervention, or standard care were included. The main outcomes of this systematic review were pain, range of motion, and oral function. Forty-eight studies met the inclusion criteria and were analyzed. DATA EXTRACTION: Data were extracted in duplicate on specific study characteristics. DATA SYNTHESIS: The overall evidence for this systematic review was considered low. The trials included in this review had unclear or high risk of bias. Thus, the evidence was generally downgraded based on assessments of 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. LIMITATIONS: Quality of the evidence and heterogeneity of the studies were limitations of the study. CONCLUSIONS: No high-quality evidence was found, indicating that there is great uncertainty about the effectiveness of exercise and MT for treatment of TMD.

[Efficacy of musculoskeletal manual approach in the treatment of temporomandibular joint disorder: A systematic review with meta-analysis.](#)

Martins WR, Blasczyk JC, Aparecida Furlan de Oliveira M, Lagoa Goncalves KF, Bonini-Rocha AC, Dugailly PM, de Oliveira RJ. Man Ther. 2016 Feb;21:10-7. doi: 10.1016/j.math.2015.06.009.

BACKGROUND: Temporomandibular joint disorder (TMD) requires a complex diagnostic and therapeutic approach, which usually involves a multidisciplinary management. Among these treatments, musculoskeletal manual techniques are used to improve health and healing. OBJECTIVES: To assess the effectiveness of musculoskeletal manual approach in temporomandibular joint disorder patients. DESIGN: A systematic review with meta-analysis. METHODS: During August 2014 a systematic review of relevant databases (PubMed, The Cochrane Library, PEDro and ISI web of knowledge) was performed to identify controlled clinical trials without date restriction and restricted to the English language. Clinical outcomes were pain and range of motion focalized in temporomandibular joint. The mean difference (MD) or standard mean difference (SMD) with 95% confidence intervals (CIs) and overall effect size were calculated at every post treatment. The PEDro scale was used to demonstrate the quality of the included studies. RESULTS/FINDINGS: From the 308 articles identified by the search strategy, 8 articles met the inclusion criteria. The meta-analysis showed a significant difference ($p < 0.0001$) and large effect on active mouth opening (SMD, 0.83; 95% CI, 0.42 to 1.25) and on pain during active mouth opening (MD, 1.69; 95% CI, 1.09 to 2.30) in favor of musculoskeletal manual techniques when compared to other conservative treatments for TMD. CONCLUSIONS: 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.

[The effectiveness of physiotherapy in the management of temporomandibular disorders: A systematic review and meta-analysis.](#)

Paco M, Peleteiro B, Duarte J, Pinho T. J Oral Facial Pain Headache. Summer 2016;30(3):210-20. doi: 10.11607/ofph.1661.

AIMS: To analyze the methodologic quality, summarize the findings, and perform a meta-analysis of the results from randomized controlled trials that assessed the effects of physiotherapy management of temporomandibular disorders. METHODS: A literature review was performed using the electronic databases PubMed, Science Direct, and EBSCO. Each article was independently assessed by two investigators using the Physiotherapy Evidence Database (PEDro), Jadad scales, and the Cochrane Risk of Bias tool. A meta-analysis was conducted by using the DerSimonian-Laird random-effects method to obtain summary estimates of the standardized mean differences (SMD) and the corresponding 95% confidence intervals (95% CI). Between-study heterogeneity was computed and publication bias was assessed. RESULTS: Seven articles met the inclusion criteria and were used in the analysis, corresponding to nine estimates of SMD. The meta-analysis showed that for pain reduction, the summary SMD favored physiotherapy (SMD = -0.63; 95% CI: -0.95 to -0.31; number of studies = 8; $I^2 = 0.0\%$), while for active range of movement (ROM) the differences between the intervention and control groups were not statistically significant (SMD = 0.33; 95% CI: -0.07 to 0.72; number of studies = 9; $I^2 = 61.9\%$). CONCLUSION: Physiotherapy seems to lead to decreased pain and may improve active ROM. However, the results are not definitive and further studies and meta-analyses are needed before these results can be considered fully generalizable.

[Manual therapy for the management of pain and limited range of motion in subjects with signs and symptoms of temporomandibular disorder: a systematic review of randomised controlled trials.](#)

Calixtre LB, Moreira RF, Franchini GH, Alburguerque-Sendin F, Oliveira AB. J Oral Rehabil. 2015 Nov;42(11):847-61. doi: 10.1111/joor.12321.

There is a lack of knowledge about the effectiveness of manual therapy (MT) on subjects with temporomandibular disorders (TMD). The aim of this systematic review is to synthesise evidence regarding the isolated effect of MT in improving maximum mouth opening (MMO) and pain in subjects with signs and symptoms of TMD. MEDLINE[®], Cochrane, Web of Science, SciELO and EMBASE[™] electronic databases were consulted, searching for randomised controlled trials applying MT for TMD compared to other intervention, no intervention or placebo. Two authors independently extracted data, PEDro scale was used to assess risk of bias, and GRADE (Grading of Recommendations Assessment, Development and Evaluation) was applied to synthesise overall quality of the body of evidence. Treatment effect size was calculated for pain, MMO and pressure pain threshold (PPT). Eight trials were included, seven of high methodological quality. Myofascial release and massage techniques applied on the masticatory muscles are more effective than control (low to moderate evidence) but as effective as toxin botulinum injections (moderate evidence). Upper cervical spine thrust manipulation or mobilisation techniques are more effective than control (low to high evidence), while thoracic manipulations are not. There is moderate-to-high evidence that MT techniques protocols are effective. The methodological heterogeneity across trials protocols frequently contributed to decrease quality of evidence. In conclusion, there is widely varying evidence that MT improves pain, MMO and PPT in subjects with TMD signs and symptoms, depending on the technique. Further studies should consider using standardised evaluations and better study designs to strengthen clinical relevance.

[A systematic review of the effectiveness of exercise, manual therapy, electrotherapy, relaxation training, and biofeedback in the management of temporomandibular disorder.](#)

Medlicott MS, Harris SR.

Phys Ther. 2006 Jul;86(7):955-73.

BACKGROUND AND PURPOSE: This systematic review analyzed studies examining the effectiveness of various physical therapy interventions for temporomandibular disorder. **METHODS:** Studies met 4 criteria: (1) subjects were from 1 of 3 groups identified in the first axis of the Research Diagnostic Criteria for Temporomandibular Disorders, (2) the intervention was within the realm of physical therapist practice, (3) an experimental design was used, and (4) outcome measures assessed one or more primary presenting symptoms. Thirty studies were evaluated using Sackett's rules of evidence and 10 scientific rigor criteria. Four randomly selected articles were classified independently by 2 raters (interrater agreement of 100% for levels of evidence and 73.5% for methodological rigor). **RESULTS:** The following recommendations arose from the 30 studies: (1) active exercises and manual mobilizations may be effective; (2) postural training may be used in combination with other interventions, as independent effects of postural training are unknown; (3) mid-laser therapy may be more effective than other electrotherapy modalities; (4) programs involving relaxation techniques and biofeedback, electromyography training, and proprioceptive re-education may be more effective than placebo treatment or occlusal splints; and (5) combinations of active exercises, manual therapy, postural correction, and relaxation techniques may be effective. **DISCUSSION AND CONCLUSION:** These recommendations should be viewed cautiously. Consensus on defining temporomandibular joint disorder, inclusion and exclusion criteria, and use of reliable and valid outcome measures would yield more rigorous research.

[A systematic review of the effectiveness of physical therapy interventions for temporomandibular disorders.](#)

McNeely ML, Armijo Olivo S, Magee DJ.

Phys Ther. 2006 May;86(5):710-25.

BACKGROUND AND PURPOSE: The purpose of this qualitative systematic review was to assess the evidence concerning the effectiveness of physical therapy interventions in the management of temporomandibular disorders. **METHODS:** A literature search of published and unpublished articles resulted in the retrieval of 36 potential articles. **RESULTS:** Twelve studies met all selection criteria for inclusion in the review: 4 studies addressed the use of therapeutic exercise interventions, 2 studies examined the use of acupuncture, and 6 studies examined electrophysical modalities. Two studies provided evidence in support of postural exercises to reduce pain and to improve function and oral opening. One study provided evidence for the use of manual therapy in combination with active exercises to reduce pain and to improve oral opening. One study provided evidence in support of acupuncture to reduce pain when compared with no treatment; however, in another study no significant differences in pain outcomes were found between acupuncture and sham acupuncture. Significant improvements in oral opening were found with muscular awareness relaxation therapy, biofeedback training, and low-level laser therapy treatment. **DISCUSSION AND CONCLUSION:** Most of the studies included in this review were of very poor methodological quality; therefore, the findings should be interpreted with caution.

Abstracts: Manipulation / Chiropractic Care

[Mandibular manipulation for the treatment of temporomandibular disorder.](#)

Alves BM, Macedo CR, Januzzi E, Grossmann E, Atallah AN, Peccin S.

J Craniofac Surg. 2013 Mar;24(2):488-93. doi: 10.1097/SCS.0b013e31827c81b3

The aim of this study was to conduct a systematic review to identify the randomized clinical studies that had investigated the following research question: Is the mandibular manipulation technique an effective and safe technique for the treatment of the temporomandibular joint disk displacement without reduction? The systematic search was conducted in the electronic databases: PubMed (Medical Publications), LILACS (Latin American and Caribbean Literature in Health Sciences), EMBASE (Excerpta Medica Database), PEDro (Physiotherapy Evidence Database), BBO (Brazilian Library of Odontology), CENTRAL (Library Cochrane), and SciELO (Scientific Electronic Library Online). The abstracts of presentations in physical therapy meetings were manually selected, and the articles of the ones that meet the requirements were investigated. No language restrictions were considered. Only randomized and controlled clinical studies were included. Two 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. Being minimally invasive, this therapy is attractive as an initial approach, especially considering the cost of the alternative approaches. The analysis of the results suggests that additional high-quality randomized clinical trials are necessary on the topic, and they 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.

[Manipulative and multimodal therapy for upper extremity and temporomandibular disorders: a systematic review.](#)

Brantingham JW, Cassa TK, Bonnefin D, Pribicevic M, Robb A, Pollard H, Tong V, Korporaal C.
J Manipulative Physiol Ther. 2013 Mar-Apr;36(3):143-201. doi: 10.1016/j.jmpt.2013.04.001.

OBJECTIVE: The purpose of this study was to complete a systematic review of manual and manipulative therapy (MMT) for common upper extremity pain and disorders including the temporomandibular joint (TMJ). **METHODS:** A literature search was conducted using the Cumulative Index of Nursing Allied Health Literature, PubMed, Manual, Alternative, and Natural Therapy Index System (MANTIS), Physiotherapy Evidence Database (PEDro), Index to Chiropractic Literature, Google Scholar, and hand search inclusive of literature from January 1983 to March 5, 2012. Search limits included the English language and human studies along with MeSH terms such as manipulation, chiropractic, osteopathic, orthopedic, and physical therapies. Inclusion criteria required an extremity peripheral diagnosis (for upper extremity problems including the elbow, wrist, hand, finger and the (upper quadrant) temporomandibular joint) and MMT with or without multimodal therapy. Studies were assessed using the PEDro scale in conjunction with modified guidelines and systems. After synthesis and considered judgment scoring was complete, evidence grades of "A, B, C and I" were applied. **RESULTS:** Out of 764 citations reviewed, 129 studies were deemed possibly to probably useful and/or relevant to develop expert consensus. Out of 81 randomized controlled or clinical trials, 35 were included. Five controlled or clinical trials were located and 4 were included. Fifty case series, reports and/or single-group pre-test post-test prospective case series were located with 32 included. There is Fair (B) level of evidence for MMT to specific joints and the full kinetic chain combined generally with exercise and/or multimodal therapy for lateral epicondylopathy, carpal tunnel syndrome, and temporomandibular joint disorders, in the short term. **CONCLUSION:** The information from this study will help guide practitioners in the use of MMT, soft tissue technique, exercise, and/or multimodal therapy for the treatment of a variety of upper extremity complaints in the context of the hierarchy of published and available evidence.

[Low-level laser therapy for temporomandibular disorders: A systematic review with meta-analysis.](#)

Xu GZ, Jia J, Jin L, Li JH, Wang ZY, Cao DY.
Pain Res Manag. 2018 May 10;2018:4230583. doi: 10.1155/2018/4230583. eCollection 2018.

OBJECTIVES: We systematically reviewed randomized controlled trials (RCTs) of the effect of low-level laser therapy (LLLT) versus placebo in patients with temporomandibular disorder (TMD). **METHODS:** A systematic search of multiple online sources electronic databases was undertaken. The methodological quality of each included study was assessed using the modified Jadad scale, and the quality of evidence was evaluated using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) system. **RESULTS:** A total of 31 RCTs were included. Total modified Jadad scale scores showed that the methodological quality was high in 30 studies and low in 1 study. Combining data from all clinically heterogeneous studies revealed positive effects of LLLT on pain relief, regardless of the visual analogue scale (VAS) score or the change of VAS score between the baseline and the final follow-up time point, while dosage analyses showed discrepant results about the effects of high or low doses for patients with TMD. Follow-up analyses showed that LLLT significantly reduced pain at the short-term follow-up. Temporomandibular joint function outcomes indicated that the overall effect favored LLLT over placebo. **CONCLUSION:** This systematic review suggests that LLLT effectively relieves pain and improves functional outcomes in patients with TMD.

[Efficacy of low-level laser therapy in the treatment of temporomandibular myofascial pain: A systematic review and meta-analysis.](#)

Munguia FM, Jang J, Salem M, Clark GT, Enciso R.
J Oral Facial Pain Headache. Summer 2018;32(3):287-297. doi: 10.11607/ofph.2032.

AIMS: To conduct a systematic review and meta-analysis to determine the efficacy of low-level laser therapy (LLLT) in treating temporomandibular myofascial pain in adults compared to laser placebo. **METHODS:** Randomized, placebo-controlled studies were identified by a search on March 2, 2016 and updated on February 9, 2017 in the PubMed, Web of Science, and Cochrane Library databases. Three of the authors assessed the studies for risk of bias. Outcomes included pain reduction on a visual analog scale (VAS) and interincisal opening. **RESULTS:** The initial search strategy yielded 142 unduplicated references assessed independently by three review authors. After evaluation, this number was reduced to eight relevant studies for inclusion in this review. Of these eight studies, four were at unclear risk of bias and four were at high risk. In a meta-analysis, pain intensity was significantly reduced after treatment in the group that received LLLT as compared to laser placebo (an average of 2.2 units on a scale of 0 to 10) ($P = .005$) and an average of 2.4 units 3 to 4 weeks later ($P = .022$). Pooled results showed a significant increase in interincisal opening at 1 month after treatment ($P = .012$), but not when the treatment was completed ($P = .079$). **CONCLUSION:** The findings from this systematic review showed that LLLT seems to be effective in reducing pain in patients with temporomandibular myofascial pain with moderate-quality evidence. However, due to the high heterogeneity, small number, and high risk of bias of the included studies, the results are not definitive, and further well-designed studies are needed.

[Efficacy of low-level laser therapy in temporomandibular disorders: A systematic review.](#)

Shukla D, Muthusekhar MR.
Natl J Maxillofac Surg. 2016 Jan-Jun;7(1):62-66. doi: 10.4103/0975-5950.196127.

PURPOSE: The aim of this systematic review was to assess the efficacy of low-level laser therapy (LLLT) in patients with temporomandibular disorders (TMDs). **METHODS:** Medline search was done from 1997 to 2011 using search terms appropriate to establishing a relation between LLLT and TMD. Only randomized controlled trials were included in this study. Outcome variables related to pain, muscle tenderness, mandibular movements, and Electromyographic (EMG) activity were considered. Of the 242 articles examined, 13 were finally included in the critical analysis conducted as a part of the present systematic review. **RESULTS:** Of the 242 titles reviewed, only 13 articles were considered eligible. 7 articles showed

significant improvement in the study group, whereas 5 showed no significant improvement between the study and control groups. The primary outcome of most of the studies was pain. Other variables considered were muscle tenderness, mandibular movements; EMG activity was considered. CONCLUSION: Our results have shown that LLLT seems to be effective in reducing pain in TMD's. It may be a treatment option for patients with an interest in a noninvasive, complementary therapy.

[Analysis of laser therapy and assessment methods in the rehabilitation of temporomandibular disorder: a systematic review of the literature.](#)

Herpich CM, Amaral AP, Leal-Junio EC, Tosato Jde P, Gomes CA, Arruda EE, Gloria IP, Garcia MB, Barbosa BR, Rodrigues MS, Silva KL, El Hage Y, Politti F, Gonzalez Tde O, Bussadori SK, Biasotto-Gonzalez DA.

J Phys Ther Sci. 2015 Jan;27(1):295-301. doi: 10.1589/jpts.27.295.

The aim of the present study was to perform a systematic review of the literature on the effects of low-level laser therapy in the treatment of TMD, and to analyze the use of different assessment tools. [Subjects and Methods] Searches were carried out of the BIREME, MEDLINE, PubMed and SciELO electronic databases by two independent researchers for papers published in English and Portuguese using the terms: "temporomandibular joint laser therapy" and "TMJ laser treatment". [Results] Following the application of the eligibility criteria, 11 papers were selected for in-depth analysis. The papers analyzed exhibited considerable methodological differences, especially with regard to the number of sessions, anatomic site and duration of low-level laser therapy irradiation, as well as irradiation parameters, diagnostic criteria and assessment tools. [Conclusion] Further studies are needed, especially randomized clinical trials, to establish the exact dose and ideal parameters for low-level laser therapy and define the best assessment tools in this promising field of research that may benefit individuals with signs and symptoms of TMD.

[Efficacy of low-level laser therapy in the treatment of TMDs: a meta-analysis of 14 randomised controlled trials.](#)

Chen J, Huang Z, Ge M, Gao M.

J Oral Rehabil. 2015 Apr;42(4):291-9. doi: 10.1111/joor.12258.

This study was designed to evaluate the efficacy of low-level laser therapy (LLLT) in the treatment of temporomandibular disorders (TMDs). We searched electronic databases and references lists of relevant articles, retrieved all of the published randomised controlled trials in regard to these issues and then performed a meta-analysis. 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 (weighted mean difference = -19.39; 95% confidence interval = -40.80-2.03; $P < 0.00001$; $I(2) = 99\%$). However, the LLLT provided significant better functional outcomes in terms of maximum active vertical opening (MAVO) (weighted mean difference = 4.18; 95% confidence interval = 0.73-7.63; $P = 0.006$; $I(2) = 73\%$), maximum passive vertical opening (MPVO) (weighted mean difference = 6.73; 95% confidence interval = 0.34-12.13; $P = 0.06$; $I(2) = 73\%$), protrusion excursion (PE) (weighted mean difference = 1.81; 95% confidence interval = 0.79-2.83; $P = 0.059$; $I(2) = 0\%$) and right lateral excursion (RLE) (weighted mean difference = 2.86; 95% confidence interval = 1.27-4.45; $P = 0.01$; $I(2) = 73\%$). The results of our meta-analysis have provided the best evidence on the efficacy of LLLT in the treatment of TMDs. 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.

[Low level laser therapy for the treatment of temporomandibular disorders: a systematic review of the literature.](#)

Melis M, Di Giosia M, Zawawi KH.

Cranio. 2012 Oct;30(4):304-12.

The authors performed a review of the literature to evaluate the efficacy of low level laser therapy (LLLT) for the treatment of temporomandibular disorders (TMD). Selection criteria included: 1) human subjects, 2) articles written in English, and 3) randomized placebo-controlled trials. Evaluation was performed according to the CONSORT 2010 criteria. A total of 14 articles were included in the review. Studies varied considerably in terms of methodological design, particularly regarding the site of application of the laser beam, the number of applications performed, their duration, the laser beam features (wavelength, frequency, output, dosage), and outcome measures. The outcome of the trials was controversial and not particularly related to any features of the laser beam, to the number of laser applications, and their duration. Based on the results of this review no definitive conclusions can be drawn on the efficacy of LLLT for the treatment of TMD. Many methodological differences among the studies, especially regarding the number and duration of laser applications and characteristics of the laser beam (wavelength, frequency, output), do not allow for standardized guidelines for effective treatment with LLLT. The only indication seems to be that LLLT is probably more effective for the treatment of TMJ disorders, and less effective for the treatment of masticatory muscle disorders.

[Effect of low-level laser therapy on pain levels in patients with temporomandibular disorders: a systematic review.](#)

Maia ML, Bonjardim LR, Quintas Jde S, Ribeiro MA, Maia LG, Conti PC.

J Appl Oral Sci. 2012 Nov-Dec;20(6):594-602.

Temporomandibular disorders (TMD) are characterized by the presence of temporomandibular joint (TMJ) and/or masticatory muscle pain and dysfunction. Low-level laser is presented as an adjuvant therapeutic modality for the treatment of TMD, especially when the presence of inflammatory pain is suspected. OBJECTIVE: To systematically review studies that investigated the effect of low level laser therapy (LLLT) on the pain levels in individuals with TMD. MATERIAL AND METHODS: The databases Scopus, embase, ebSCO and PubMed were reviewed from January/2003 to October/2010 with the following keywords: laser therapy, low-level laser therapy, temporomandibular joint disorders, temporomandibular joint dysfunction syndrome, temporomandibular joint, temporomandibular, facial pain and arthralgia, with the inclusion criteria for intervention studies in humans. exclusion criteria adopted were intervention studies in animals, studies that were not written in english, Spanish or Portuguese, theses, monographs, and abstracts presented in scientific events. RESULTS: After a careful review, 14 studies fit the criteria for inclusion, of which, 12 used a placebo group. As for the protocol for laser application, the energy density used ranged from 0.9 to 105 J/cm², while the power density ranged from 9.8 to 500 mW. The number of sessions varied from 1 to 20 and the frequency of applications ranged from daily for 10 days to 1 time per week for 4 weeks. A reduction in pain levels was reported in 13 studies, with 9 of these occurring only in the experimental group, and 4 studies

reporting pain relief for both the experimental group and for the placebo. CONCLUSION: Most papers showed that LLLT seemed to be effective in reducing pain from TMD. However, the heterogeneity of the standardization regarding the parameters of laser calls for caution in interpretation of these results. Thus, it is necessary to conduct further research in order to obtain a consensus regarding the best application protocol for pain relief in patients with TMD.

[Is low level laser effective for the treatment of orofacial pain?: A systematic review.](#)

Tengrungsun T, Mitriattanakul S, Buranaprasertsuk P, Suddhasthir T.
Cranio. 2012 Oct;30(4):280-5.

The aim of this study was to assess the effectiveness of low level laser therapy (LLLT) as a treatment for orofacial pain considering the methodology of the studies. PubMed (1983-2009) and one conference proceeding were searched. Studying quality was assessed using a validated instrument. A high-quality score was defined as high or low. Outcomes were defined as either positive (+), neutral (0), or negative (-). Thirty-three studies met inclusion criteria. The best evidence synthesis method was used to formulate outcome of LLLT for each type of control group. LLLT vs. placebo pooling revealed high-quality trials in three of eight positive studies. In LLLT vs. other active treatment pooling, two high-quality studies out of nine neutral trials were found. Quality of the trial was not significantly associated with neutral results ($p=0.05$). Only limited evidence indicated that LLLT is more effective than placebo, sham laser, and other active treatments.

[Effectiveness of low-level laser therapy in temporomandibular disorders: a systematic review and meta-analysis.](#)

Petrucci A, Sgolastra F, Gatto R, Mattei A, Monaco A.
J Orofac Pain. 2011 Fall;25(4):298-307.

AIM: To assess the scientific evidence on the efficacy of low-level laser therapy (LLLT) in the treatment of temporomandibular disorders (TMD). METHODS: The databases of PubMed, Science Direct, Cochrane Clinical Trials Register, and PEDro were manually and electronically searched up to February 2010. Two independent reviewers screened, extracted, and assessed the quality of the publications. A meta-analysis- was performed to quantify the pooled effect of LLLT on pain and function in patients with chronic TMD. RESULTS: The literature search identified 323 papers without overlap between selected databases, but after the two-phase study selection, only six randomized clinical trials (RCT) were included in the systematic review. The primary outcome of interest was the change in pain from baseline to endpoint. The pooled effect of LLLT on pain, measured through a visual analog scale with a mean difference of 7.77 mm (95% confidence interval [CI]: -2.49 to 18.02), was not statistically significant from placebo. Change from baseline to endpoint of secondary outcomes was 4.04 mm (95% CI 3.06 to 5.02) for mandibular maximum vertical opening; 1.64 mm (95% CI 0.10 to 3.17) for right lateral excursion and 1.90 mm (95% CI: -4.08 to 7.88) for left lateral excursion. CONCLUSION: Currently, there is no evidence to support the effectiveness of LLLT in the treatment of TMD. CONCLUSION: Although limited in extent, the available data support the efficacy of EMG biofeedback treatments for TMD.

Abstracts: Hypnosis / Relaxation Therapy

[Hypnosis/Relaxation therapy for temporomandibular disorders: a systematic review and meta-analysis of randomized controlled trials.](#)

Zhang Y, Montoya L, Ebrahim S, Busse JW, Couban R, McCabe RE, Bieling P, Carrasco-Labra A, Guyatt GH.
J Oral Facial Pain Headache. 2015 Spring;29(2):115-25. doi: 10.11607/ofph.1330.

AIMS: To conduct a systematic review and meta-analysis to evaluate the effectiveness of hypnosis/relaxation therapy compared to no/minimal treatment in patients with temporomandibular disorders (TMD). METHODS: Studies reviewed included randomized controlled trials (RCTs) where investigators randomized patients with TMD or an equivalent condition to an intervention arm receiving hypnosis, relaxation training, or hyporelaxation therapy, and a control group receiving no/minimal treatment. The systematic search was conducted without language restrictions, in Medline, EMBASE, CENTRAL, and PsycINFO, from inception to June 30, 2014. Studies were pooled using weighted mean differences and pooled risk ratios (RRs) for continuous outcomes and dichotomous outcomes, respectively, and their associated 95% confidence intervals (CI). RESULTS: Of 3,098 identified citations, 3 studies including 159 patients proved eligible, although none of these described their method of randomization. The results suggested limited or no benefit of hypnosis/relaxation therapy on pain (risk difference in important pain -0.06; 95% CI: -0.18 to 0.05; $P = .28$), or on pressure pain thresholds on the skin surface over the temporomandibular joint (TMJ) and masticatory muscles. Low-quality evidence suggested some benefit of hypnosis/relaxation therapy on maximal pain (mean difference on 100-mm scale = -28.33; 95% CI: -44.67 to -11.99; $P = .007$) and active maximal mouth opening (mean difference on 100-mm scale = -2.63 mm; 95% CI: -3.30 mm to -1.96 mm; $P < .001$) compared to no/minimal treatment. CONCLUSION: Three RCTs were eligible for the systematic review, but they were with high risk of bias and provided low-quality evidence, suggesting that hypnosis/relaxation therapy may have a beneficial effect on maximal pain and active maximal mouth opening but not on pain and pressure pain threshold. Larger RCTs with low risk of bias are required to confirm or refute these findings and to inform other important patient outcomes.

[Single puncture versus standard double needle arthrocentesis for the management of temporomandibular joint disorders: A systematic review.](#)

Nagori SA, Roy Chowdhury SK, Thukral H, Jose A, Roychoudhury A.
J Oral Rehabil. 2018 Oct;45(10):810-818. doi: 10.1111/joor.12665.

The aim of this systematic review was to investigate the current evidence in order to assess the efficacy of single puncture arthrocentesis vs standard double needle arthrocentesis in the management of temporomandibular joint (TMJ) disorders. An electronic search of the PubMed, Scopus, Cochrane CENTRAL and Google Scholar databases was performed to identify English studies published up until October 2017. Eligible studies were selected based on inclusion criteria and included randomised controlled trials (RCTs) comparing single puncture arthrocentesis and standard double needle arthrocentesis for the management TMJ disorders. The initial screening identified 984 records, of which only 5 fulfilled the inclusion criteria. A high degree of heterogeneity was found in the 5 studies with each reporting different sample selection and arthrocentesis protocol. All 5 studies reported no difference in reduction in pain intensity and improvement in maximal mouth opening between the single puncture technique and standard double needle technique. This review provides some evidence that single puncture arthrocentesis is clinically as efficacious as standard double needle arthrocentesis. There is a need of well-designed RCT with standard protocol of arthrocentesis comparing different single puncture techniques and standard double needle technique for the management of TMJ disorders.

[A comparison of clinical follow-up of different total temporomandibular joint replacement prostheses: A systematic review and meta-analysis.](#)

Zou L, He D, Ellis E.
J Oral Maxillofac Surg. 2018 Feb;76(2):294-303. doi: 10.1016/j.joms.2017.08.022.

PURPOSE: There are different total temporomandibular joint (TMJ) prostheses on the market but no comparison of their efficacy. The purpose of this meta-analysis was to evaluate the effectiveness of different TMJ replacement (TJR) systems. **MATERIALS AND METHODS:** A systematic review and meta-analysis was performed using the PubMed, Embase, Medline, and Cochrane Library search engines in May 2017 to identify qualified studies. Outcome measurements were changes in maximal incisal opening (MIO), pain, dietary limitations, and functional deficiencies from before to after TJR. Analyses of heterogeneity, sensitivity, and publication bias were performed. A fixed-effects model was used for the meta-analysis of pooled weighted mean differences in pre-versus postoperative MIO, pain, diet, and function. **RESULTS:** Twenty studies with 1,262 patients were included in the meta-analysis. Comparison of the TJR systems showed no real difference for pre- versus postoperative MIO, pain, diet, and function. MIO and functional efficiency decreased gradually over time, but effective pain relief and improvements in dietary limitations were stable with no relevant differences during follow-up. Comparison of the custom and stock devices showed similar results for pre- and postoperative MIO, pain, function, and diet. **CONCLUSION:** This analysis showed no relevant difference in treatment outcomes among the TJR systems.

[Outcomes of therapeutic TMD interventions on oral health related quality of life: A qualitative systematic review.](#)

Song YL, Yap AU.
Quintessence Int. 2018;49(6):487-496. doi: 10.3290/j.qi.a04340.

OBJECTIVES: This systematic review aims to determine the impact of temporomandibular disorder (TMD) therapeutic interventions on patients' oral health related quality of life (OHRQoL) and to recommend approaches that improve QoL. **DATA SOURCES:** A systematic search of the literature was performed between January 2007 and October 2017 to identify articles on TMD interventions and OHRQoL. Randomized controlled trials, and retrospective and prospective cohort studies that mentioned dedicated tools for measurement of OHRQoL changes in TMD patients after therapeutic interventions were included. Abstracts of studies that did not mention any form of measurement of OHRQoL in their treatment outcome were excluded. The initial screening yielded 171 articles. After evaluation of abstracts and full text articles, five articles fulfilled all selection criteria and were included. Most TMD treatment interventions seem to improve QoL to some extent, but no single treatment modality can be advocated as the sole approach to managing TMD. **CONCLUSION:** Psychotherapy, occlusal appliance therapy, arthrocentesis, and orthodontics/orthognathic surgery (in subjects with severe malocclusion) appear to improve OHRQoL of TMD patients. Recommendation on the best TMD intervention for improving QoL could not be made due to the diverse TMD subtypes and non-disease specific OHRQoL instruments employed. More studies incorporating TMD-specific OHRQoL measures and targeting explicit TMD subtypes based on internationally accepted diagnostic criteria are warranted in this area of research.

[Temporomandibular lavage versus nonsurgical treatments for temporomandibular disorders: A systematic review and meta-analysis.](#)

Bouchard C, Goulet JP, El-ouazzani M, Turgeon AF.
J Oral Maxillofac Surg. 2017 Jul;75(7):1352-1362. doi: 10.1016/j.joms.2016.12.027.

PURPOSE: To investigate the efficacy of temporomandibular joint (TMJ) lavage (arthrocentesis or arthroscopy) for the treatment of temporomandibular disorders in reducing pain and improving jaw motion. **PATIENTS AND METHODS:** We performed a systematic review of the literature and meta-analysis of randomized controlled trials (RCTs) comparing TMJ lavage with conservative measures. The data sources were MEDLINE, Embase, CENTRAL (Cochrane Central Register of Controlled Trials), Scopus, Web of Science, and reference lists of relevant articles. Two independent reviewers identified RCTs by using controlled vocabulary (MeSH, Emtree) and free text terms. Data extracted from the selected studies included population characteristics, interventions, outcomes, and funding sources. Risk of bias was assessed with the Cochrane Collaboration risk assessment tool for RCTs. **RESULTS:** Five studies met the inclusion criteria, for a total of 308 patients. Of these studies, 3 were categorized as having a high risk of bias and 2 had a low risk. The summary effect of the 5 studies showed a reduction in pain in the intervention group at 6 months (-0.63; 95% confidence interval [CI], -0.90 to -0.37; $P < .00001$; $I^2 = 88\%$) and 3 months (-0.47; 95% CI, -0.75 to -0.19; $P = .001$; $I^2 = 85\%$). This was not the

case at 1 month. No difference in mouth opening was observed at 6 months (-0.21; 95% CI, -1.82 to 1.40; $P < .80$; $I^2 = 74\%$), 3 months (0.20; 95% CI, -1.81 to 2.20; $P = .85$; $I^2 = 68\%$), and 1 month (-1.18; 95% CI, -2.90 to 0.55; $P = .18$; $I^2 = 0\%$). CONCLUSIONS: Given the relatively small number of patients included in this meta-analysis, the high risk of bias in 3 studies, and the statistical and clinical heterogeneity of the included studies, the use of TMJ lavage for the treatment of temporomandibular disorders should be recommended with caution because of the lack of strong evidence to support its use.

[Total temporomandibular joint replacement prostheses: a systematic review and bias-adjusted meta-analysis.](#)

Johnson NR, Roberts MJ, Doi SA, Batstone MD.

Int J Oral Maxillofac Surg. 2017 Jan;46(1):86-92. doi: 10.1016/j.ijom.2016.08.022.

The aim of the present study was to determine which prosthesis has resulted in the best outcomes after total temporomandibular joint replacement (TMJR). A comprehensive electronic search was undertaken in September 2015. Inclusion criteria encompassed studies that described one of the three current TMJR systems and that had pre- and postoperative data on at least two of the following TMJR indications: pain, diet, function, and maximum inter-incisal opening (MIO). Sixteen papers were included in the systematic review, reporting 10 retrospective studies and six prospective studies (no randomized controlled or case-controlled trials). A total 312 patients with 505 TMJ Concepts prostheses, 728 patients with 1048 Biomet prostheses, and 125 patients with 196 Nexus prostheses were included in the analysis. There was no real difference between the various TMJR systems in terms of pain or diet scores. Function scores improved with the TMJ Concepts, but this was the only prosthesis for which data were available. Biomet prostheses appeared to have a greater increase in MIO mean gain compared to TMJ Concepts and Nexus prostheses; however this was heavily biased by one study. Without this study, there was no real difference in MIO. It is concluded that the prostheses are similar, but most data are available for the TMJ Concepts prosthesis, with results being favourable.

[Does orthognathic surgery cause or cure temporomandibular disorders? A systematic review and meta-analysis.](#)

Al-Moraissi EA, Wolford LM, Perez D, Laskin DM, Ellis E 3rd.

J Oral Maxillofac Surg. 2017 Sep;75(9):1835-1847. doi: 10.1016/j.joms.2017.03.029.

PURPOSE: There is still controversy about whether orthognathic surgery negatively or positively affects temporomandibular disorders (TMDs). The purpose of this study was to determine whether orthognathic surgery has a beneficial or deleterious effect on pre-existing TMDs. MATERIALS AND METHODS: A systematic review and meta-analysis were conducted based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. We searched 3 major databases to locate all pertinent articles published from 1980 to March 2016. All subjects in the various studies were stratified a priori into 9 categories based on subdiagnoses of TMDs. The predictor variables were those patients with pre-existing TMDs who underwent orthognathic surgery in various subgroups. The outcome variables were maximal mouth opening and signs and symptoms of a TMD before and after orthognathic surgery based on the type of osteotomy. The meta-analysis was performed using Comprehensive Meta-Analysis software (Biostat, Englewood, NJ). RESULTS: A total of 5,029 patients enrolled in 29 studies were included in this meta-analysis. There was a significant reduction in TMDs in patients with a retrognathic mandible after bilateral sagittal split osteotomy (BSSO) ($P = .014$), but no significant difference after bimaxillary surgery (BSSO and Le Fort I osteotomy) ($P = .336$). There was a significant difference in patients with prognathism after isolated BSSO or intraoral vertical ramus osteotomy and after combined BSSO and Le Fort I osteotomy ($P = .001$), but no significant difference after BSSO ($P = .424$) or bimaxillary surgery (intraoral vertical ramus osteotomy and Le Fort I osteotomy) ($P = .728$). CONCLUSIONS: Orthognathic surgery caused a decrease in TMD symptoms for many patients who had symptoms before surgery, but it created symptoms in a smaller group of patients who were asymptomatic before surgery. The presence of presurgical TMD symptoms or the type of jaw deformity did not identify which patients' TMDs would improve, remain the same, or worsen after surgery.

[The effect of orthognathic surgery on the temporomandibular joint and oral function: a systematic review.](#)

Te Veldhuis EC, Te Veldhuis AH, Brammer WM, Wolvius EB, Koudstaal MJ.

Int J Oral Maxillofac Surg. 2017 May;46(5):554-563. doi: 10.1016/j.ijom.2017.01.004.

The objective of this systematic review was to examine the effect of orthognathic surgery (OS) on the temporomandibular joint and oral function. Electronic databases were systematically searched for studies published until October 2015. Articles were assessed against predefined inclusion criteria. The included papers were divided into four groups based on the type of OS performed. The following items were recorded: quality of evidence using the Oxford Centre for Evidence-Based medicine (CEBM) criteria, number of patients, presence/absence of controls, mean age at treatment, follow-up time, clinical examination findings, bite force, use of the Helkimo Index and Research Diagnostic Criteria for Temporomandibular Disorders, imaging findings, and patient questionnaire results. A total of 4669 articles were identified; 76 relevant articles were included in the review. These studies assessed a total 3399 patients and 380 controls, with a mean age of 25.4 years. The great variety of OS techniques, examination techniques, diagnostic criteria, and imaging techniques used in the articles studied, as well as the quality of the study designs, made it difficult to compare studies and to draw conclusions. However, looking at the different aspects studied in general, it can be stated that OS seems to have little or no harmful effect on the TMJ and oral function (level of evidence: levels II, III, and IV).

[Interpositional arthroplasty versus reconstruction arthroplasty for temporomandibular joint ankylosis: A systematic review and meta-analysis.](#)

Ma J, Jiang H, Liang L.

J Craniomaxillofac Surg. 2015 Sep;43(7):1202-7. doi: 10.1016/j.jcms.2015.04.017.

BACKGROUND: Interpositional arthroplasty (IA) and reconstruction arthroplasty (RA) are widely used in treating temporomandibular joint ankylosis (TMJA). But the reported clinical outcomes are controversial, the debate over which one is better remains. METHODS: The Pubmed, EMBASE, OVID EBM Reviews, and Web of science were searched up to Oct 11 2014 without limitation on year, language. Only randomized controlled trials and observational cohort studies with a follow-up of at least 12 months were included. RESULTS: A total of 8 retrospective cohort studies with 234 patients with TMJA were included in meta-analysis. Pooled analysis showed no significant differences in reankylosis (RD: -0.00; 95% CI: -0.08, 0.07; $Z=0.06$; P

=0.95; I(2) =0%), and maximum incisal opening (MD=0.99; 95% CI: -1.43, 3.4, Z=0.8, p=0.42; I(2) =74%) between the IA and RA groups. CONCLUSIONS: IA and RA could produce similar outcomes in treating TMJA regarding to rankylosis and maximum incisal opening. Other postoperative complications, such as overgrowth of cartilage, malocclusion and the status of facial development should be evaluated more thoroughly.

[Open versus arthroscopic surgery for the management of internal derangement of the temporomandibular joint: a meta-analysis of the literature.](#)

Al-Moraissi EA.

Int J Oral Maxillofac Surg. 2015 Jun;44(6):763-70. doi: 10.1016/j.ijom.2015.01.024.

The objective of this study was to assess the clinical outcomes of the following three surgical methods for the management of internal derangement (ID) of the temporomandibular joint (TMJ): arthroscopic lysis and lavage (ALL), arthroscopic surgery (AS), and open surgery (OS). A systematic and electronic search of several databases with specific key words was performed from their inception through November 2014. Clinical human studies, including randomized controlled trials (RCTs), controlled clinical trials (CCTs), and retrospective studies, with the aim of comparing the three surgical methods for the management of ID of the TMJ were included. Seven publications were identified: three RCTs, two CCTs, and two retrospective studies. A significant difference was found between OS and AS in pain reduction (P=0.05), but no significant difference with regard to maximal inter-incisal opening (MIO>35mm), mandibular function impairment, and clinical findings (clicking, joint tenderness, and crepitation) (P=0.52, P=0.34, and P=0.19, respectively). The results of the meta-analysis showed that the use of OS is superior to AS in pain reduction, with comparable MIO, jaw function, and clinical findings. In addition, the results of the present study showed that ALL provides greater improvement in MIO and comparable pain reduction when compared to AS.

[Oral and maxillofacial surgery and chronic painful temporomandibular disorders--a systematic review.](#)

Lindenmeyer A, Sutcliffe P, Eghtessad M, Goulden R, Speculand B, Harris M.

J Oral Maxillofac Surg. 2010 Nov;68(11):2755-64. doi: 10.1016/j.joms.2010.05.056.

PURPOSE: To provide a systematic review of the best available research literature investigating the relation of oral and maxillofacial surgical procedures to the onset or relief of chronic painful temporomandibular disorder (TMD). MATERIALS AND METHODS: A comprehensive review of the databases CINAHL, Cochrane Library, Embase, Medline, NHS Evidence--Oral Health, PsycINFO, Web of Knowledge, and MetaLib was undertaken by 2 authors (P.S., M.H.) up to June 2009 using search terms appropriate to establishing a relation between orofacial surgical procedures and TMD. The search was restricted to English-language publications. RESULTS: Of the 1,777 titles reviewed, 35 articles were critically appraised but only 32 articles were considered eligible. These were observational studies that fell into 2 groups; 9 were seeking to establish a surgical cause for TMD. Of these, only 2 of a series of 3 claimed that there was a significant link, but this claim was based on weak data (health insurance records) and was abandoned in a subsequent report. Twenty-three studies were seeking to achieve relief by orthognathic surgical intervention. These were also negative overall, with 7 articles showing varying degrees of mostly nonsignificant improvement, whereas 16 showed no change or a worse outcome. No published report on the putative effect of implant insertion was found. CONCLUSION: These apparently contradictory approaches underline a belief that oral surgical trauma or gross malocclusion has a causative role in the onset of TMD. However, there was no overall evidence of a surgical causal etiology or orthognathic therapeutic value. This review emphasizes that it is in the patients' best interest to carry out prospective appropriately controlled randomized trials to clarify the situation.

[Orthognathic treatment and temporomandibular disorders: a systematic review. Part 1. A new quality-assessment technique and analysis of study characteristics and classifications.](#)

Al-Riyami S, Moles DR, Cunningham SJ.

Am J Orthod Dentofacial Orthop. 2009 Nov;136(5):624.e1-15; discussion 624-5. doi: 10.1016/j.ajodo.2009.02.021.

INTRODUCTION: Orthognathic treatment is undertaken to correct jaw discrepancies and involves a combination of orthodontics and surgery. The effects of orthodontic treatment on temporomandibular disorders (TMD) have been widely debated in the literature, but fewer studies focus on the effects of orthognathic treatment on TMD. METHODS: A systematic review was conducted to (1) determine the percentage of orthognathic patients with signs or symptoms of TMD, (2) establish the range of signs or symptoms, and (3) examine studies that followed patients longitudinally through treatment to determine the effect of orthognathic intervention on TMD symptoms. RESULTS: Of 480 identified articles, 53 were eligible for inclusion in this review. Part 1 of this 2-part article describes the methodology of conducting this review, the difficulties encountered (including the quality-assessment issues), and a narrative analysis of study characteristics and classification methods. Part 2 reports the remaining results, evidence tables, and meta-analyses. CONCLUSIONS: The diversity of diagnostic criteria and classification methods used in the included studies makes interstudy comparisons difficult. There is a definitive need for well-designed studies with standardized diagnostic criteria and classification methods for TMD.

[Orthognathic treatment and temporomandibular disorders: a systematic review. Part 2. Signs and symptoms and meta-analyses.](#)

Al-Riyami S, Cunningham SJ, Moles DR.

Am J Orthod Dentofacial Orthop. 2009 Nov;136(5):626.e1-16, discussion 626-7. doi: 10.1016/j.ajodo.2009.02.022.

INTRODUCTION: There have been conflicting viewpoints in the literature regarding the effects of orthognathic treatment on temporomandibular disorders (TMD). A systematic review was conducted to determine the percentage of orthognathic patients with TMD, establish the range of signs and symptoms, and follow patients longitudinally through treatment for any changes in signs and symptoms. METHODS: Part 1 of this 2-part article described the methodology of this review, with a narrative analysis of the study characteristics and the TMD classification methods. Part 2 describes the percentage of patients suffering from TMD and the signs and symptoms reported. Meta-analyses were conducted on data from clinically similar studies. RESULTS: Pain decreased after surgery for both self-reported symptoms and clinically diagnosed pain on palpation. However, postsurgical results were more varied for joint sounds. The percentage of patients with clicking had a tendency to decrease postsurgery, but improvements in crepitus were questionable. The results from all meta-analyses in this review were subject to considerable statistical heterogeneity, and it was not possible to draw strong inferences relating to the percentage of orthognathic surgery patients with TMD with any degree of certainty. CONCLUSIONS:

Although orthognathic surgery should not be advocated solely for treating TMD, patients having orthognathic treatment for correction of their dentofacial deformities and who are also suffering from TMD appear more likely to see improvement in their signs and symptoms than deterioration.

[Meta-analysis of surgical treatments for temporomandibular articular disorders.](#)

Reston JT, Turkelson CM.

J Oral Maxillofac Surg. 2003 Jan;61(1):3-10; discussion 10-2.

PURPOSE: Temporomandibular joint articular disorders may cause severe pain and dysfunction. We addressed the following questions. Can any surgical procedures effectively treat these disorders? If so, which procedures are most effective? **MATERIALS AND METHODS:** We performed meta-analyses of surgical trial results to determine whether certain surgical procedures are effective in specific patient groups. To compensate for the lack of parallel control groups in published studies and for the improvement that has been observed in untreated patients, we used historical data from nonsurgical trials to derive 3 estimates of historical control group improvement (0%, 37.5%, and 75%). To our knowledge, this is the first meta-analytic evaluation of surgical treatments for temporomandibular joint disorders. **RESULTS:** Among patients refractory to nonsurgical therapies, surgical arthrocentesis and arthroscopy were effective for patients with disc displacement without reduction at all assumed control group improvement rates. Disc repair/repositioning had a statistically significant effect at all but the highest improvement rate. In patients with disc displacement with reduction, arthroscopy and disc repair/repositioning had statistically significant effects at all but the highest assumed rate of control group improvement. There were no statistically significant differences between the effects of any treatments. **CONCLUSIONS:** Surgical treatments appear to provide some benefit to patients refractory to nonsurgical therapies. The most reliable evidence supports the effectiveness of arthrocentesis and arthroscopy for patients with disc displacement without reduction. Better designed trials are needed before one can accurately determine the magnitude of the benefits of surgery.

Abstracts: Occlusal Adjustment Therapy

[Is splint therapy required after arthrocentesis to improve outcome in the management of temporomandibular joint disorders? A systematic review and meta-analysis.](#)

Nagori SA, Jose A, Roy Chowdhury SK, Roychoudhury A.

Oral Surg Oral Med Oral Pathol Oral Radiol. 2019 Feb;127(2):97-105. doi: 10.1016/j.oooo.2018.09.010.

OBJECTIVE: The aim of this systematic review was to assess the efficacy of splint therapy in improving outcomes after arthrocentesis for the management of temporomandibular joint disorders. **STUDY DESIGN:** A comprehensive electronic search was conducted to search for randomized control trials, controlled clinical trials, and retrospective studies comparing arthrocentesis and splint therapy with arthrocentesis alone. **RESULTS:** Six studies were included in this review. There was no statistical significant difference in pain reduction with or without the use of splint after arthrocentesis at 1 month (fixed: weighted mean difference [WMD] = -0.01; 95% confidence interval [CI] -0.46 to 0.44; P = .96; I2 = 0%) and 6 months (fixed: WMD = -0.08; 95% CI -0.27 to 0.42; P = .66; I2 = 0%). Similarly, no difference was seen in improvement in maximal mouth opening at 1 month (fixed: WMD = -0.16; 95% CI -1.75 to 1.42; P = .84; I2 = 44%), and 6 months (fixed: WMD = -0.83; 95% CI -0.52 to 2.18; P = .23; I2 = 0%). **CONCLUSIONS:** Within the limitation of this review, there is some evidence that splint therapy may not improve outcomes after arthrocentesis. There is a need for well-designed RCTs evaluating the additional benefit of splint therapy after arthrocentesis for managing temporomandibular joint disorders.

[Outcomes of therapeutic TMD interventions on oral health related quality of life: A qualitative systematic review.](#)

Song YL, Yap AU.

Quintessence Int. 2018;49(6):487-496. doi: 10.3290/j.qi.a40340.

OBJECTIVES: This systematic review aims to determine the impact of temporomandibular disorder (TMD) therapeutic interventions on patients' oral health related quality of life (OHRQoL) and to recommend approaches that improve QoL. **DATA SOURCES:** A systematic search of the literature was performed between January 2007 and October 2017 to identify articles on TMD interventions and OHRQoL. Randomized controlled trials, and retrospective and prospective cohort studies that mentioned dedicated tools for measurement of OHRQoL changes in TMD patients after therapeutic interventions were included. Abstracts of studies that did not mention any form of measurement of OHRQoL in their treatment outcome were excluded. The initial screening yielded 171 articles. After evaluation of abstracts and full text articles, five articles fulfilled all selection criteria and were included. Most TMD treatment interventions seem to improve QoL to some extent, but no single treatment modality can be advocated as the sole approach to managing TMD. **CONCLUSION:** Psychotherapy, occlusal appliance therapy, arthrocentesis, and orthodontics/orthognathic surgery (in subjects with severe malocclusion) appear to improve OHRQoL of TMD patients. Recommendation on the best TMD intervention for improving QoL could not be made due to the diverse TMD subtypes and non-disease specific OHRQoL instruments employed. More studies incorporating TMD-specific OHRQoL measures and targeting explicit TMD subtypes based on internationally accepted diagnostic criteria are warranted in this area of research.

[Occlusal stabilization splint for patients with temporomandibular disorders: Meta-analysis of short and long term effects.](#)

Kuzmanovic Pfcir J, Dodic S, Lazic V, Trajkovic G, Milic N, Milicic B.

PLoS One. 2017 Feb 6;12(2):e0171296. doi: 10.1371/journal.pone.0171296. eCollection 2017.

BACKGROUND: Psychological discomfort, physical disability and functional limitations of the orofacial system have a major impact on everyday life of patients with temporomandibular disorders (TMDs). In this study we sought to determine short and long term effects of stabilization splint (SS) in treatment of TMDs, and to identify factors influencing its efficacy. **METHODS:** MEDLINE, Web of Science and EMBASE were searched for

randomized controlled trials (RCTs) comparing SS to: non-occluding splint, occlusal oral appliances, physiotherapy, behavioral therapy, counseling and no treatment. Random effects method was used to summarize outcomes. The effect estimates were expressed as odds ratio (OR) or standardized mean difference (SMD) with 95% confidence interval. Subgroup analyses were carried out according to the use of Research Diagnostic Criteria (RDC/TMD) and TMDs origin. Strength of evidence was assessed by GRADE. Meta-regression was applied. RESULTS: Thirty three eligible RCTs were included in meta-analysis. In short term, SS presented positive overall effect on pain reduction (OR 2.08; $p = 0.01$) and pain intensity (SMD -0.33; $p = 0.02$). Subgroup analyses confirmed SS effect in studies used RDC/TMD and revealed its effect in patients with TMDs of muscular origin. Important decrease of muscle tenderness (OR 1.97; $p = 0.03$) and improvement of mouth opening (SMD -0.30; $p = 0.04$) were found. SS in comparison to oral appliances showed no difference (OR 0.74; $p = 0.24$). Meta-regression identified continuous use of SS during the day as a factor influencing efficacy ($p = 0.01$). Long term results showed no difference in observed outcomes between groups. Low quality of evidence was found for primary outcomes. CONCLUSION: SS presented short term benefit for patients with TMDs. In long term follow up, the effect is equalized with other therapeutic modalities. Further studies based on appropriate use of standardized criteria for patient recruitment and outcomes under assessment are needed to better define SS effect persistence in long term.

[Prosthodontic planning in patients with temporomandibular disorders and/or bruxism: A systematic review.](#)

Manfredini D, Poggio CE.

J Prosthet Dent. 2017 May;117(5):606-613. doi: 10.1016/j.prosdent.2016.09.012.

STATEMENT OF PROBLEM: The presence of temporomandibular disorders (TMDs) and/or bruxism signs and symptoms may present multifaceted concerns for the prosthodontist. PURPOSE: The purpose of this systematic review was to evaluate the relationship between prosthetic rehabilitation and TMDs and bruxism. MATERIAL AND METHODS: Three research questions were identified based on different clinical scenarios. Should prosthodontics be used to treat TMD and/or bruxism? Can prosthodontics cause TMDs and/or bruxism? How can prosthodontics be performed (for prosthetic reasons) in patients with TMDs and/or bruxism? A systematic search in the PubMed database was performed to identify all randomized clinical trials (RCTs) comparing the effectiveness of prosthodontics with that of other treatments in the management of TMDs and/or bruxism (question 1); clinical trials reporting the onset of TMDs and/or bruxism after the execution of prosthetic treatments in healthy individuals (question 2); and RCTs comparing the effectiveness of different prosthodontics strategies in the management of the prosthetic needs in patients with TMDs and/or bruxism (question 3). RESULTS: No clinical trials of the reviewed topics were found, and a comprehensive review relying on the best available evidence was provided. Bruxism is not linearly related to TMDs, and both of these conditions are multifaceted. Based on the diminished causal role of dental occlusion, prosthetic rehabilitation cannot be recommended as a treatment for the 2 conditions. In theory, they may increase the demand for adaptation beyond the stomatognathic system's tolerability. No evidence-based guidelines were available for the best strategy for managing prosthetic needs in patients with TMDs and/or bruxism. CONCLUSIONS: This systematic review of publications revealed an absence of RCTs on the various topics concerning the relationship between TMD and bruxism and prosthodontics. Based on the best available evidence, prosthetic changes in dental occlusion are not yet acceptable as strategies for solving TMD symptoms or helping an individual stop bruxism. Clinicians should take care when performing irreversible occlusal changes in healthy individuals and in patients with TMD and/or bruxism.

[Efficacy of splint therapy for the management of temporomandibular disorders: a meta-analysis.](#)

Zhang C, Wu JY, Deng DL, He BY, Tao Y, Niu YM, Deng MH.

Oncotarget. 2016 Dec 20;7(51):84043-84053. doi: 10.18632/oncotarget.13059.

Temporomandibular disorders (TMD) are a group of clinical problems affecting temporomandibular joint (TMJ), myofascial muscles and other related structures. Splint therapy is the most commonly used approach to treatment of TMD, but its effectiveness is remains unclear. We therefore conducted a meta-analysis to evaluate the effectiveness of splint therapy for TMD in adults. The electronic databases PubMed, EMBASE, Cochrane Library, and ClinicalTrials.gov were searched for reports published up to March 31, 2016. Thirteen eligible studies involving 538 patients were identified. The results indicated that splint therapy increased maximal mouth opening (MMO) for patients with a MMO <45mm and reduced pain intensity measured using the visual analogue scale (VAS) for patients with TMD without specific description (TMDSD). Splint therapy also reduced the frequency of painful episodes for patients with TMJ clicking. No publication bias was observed, as determined with Egger's test for all outcomes. On the basis of this evidence, we recommend the use of splints for the treatment and control of TMD in adults.

[Effect of chin-cup treatment on the temporomandibular joint: a systematic review.](#)

Zurfluh MA, Kloukos D, Patcas R, Eliades T.

Eur J Orthod. 2015 Jun;37(3):314-24. doi: 10.1093/ejo/cju048.

AIM: To systematically search the literature and assess the available evidence for the influence of chin-cup therapy on the temporomandibular joint regarding morphological adaptations and appearance of temporomandibular disorders (TMD). MATERIALS AND METHODS: Electronic database searches of published and unpublished literature were performed. The following electronic databases with no language and publication date restrictions were searched: MEDLINE (via Ovid and PubMed), EMBASE (via Ovid), the Cochrane Oral Health Group's Trials Register, and CENTRAL. Unpublished literature was searched on ClinicalTrials.gov, the National Research Register, and Pro-Quest Dissertation Abstracts and Thesis database. The reference lists of all eligible studies were checked for additional studies. Two review authors performed data extraction independently and in duplicate using data collection forms. Disagreements were resolved by discussion or the involvement of an arbiter. RESULTS: From the 209 articles identified, 55 papers were considered eligible for inclusion in the review. Following the full text reading stage, 12 studies qualified for the final review analysis. No randomized clinical trial was identified. Eight of the included studies were of prospective and four of retrospective design. All studies were assessed for their quality and graded eventually from low to medium level of evidence. Based on the reported evidence, chin-cup therapy affects the condylar growth pattern, even though two studies reported no significance changes in disc position and arthrosis configuration. Concerning the incidence of TMD, it can be concluded from the available evidence that chin-cup therapy constitutes no risk factor for TMD. CONCLUSION: Based on the available evidence, chin-cup therapy for Class III orthodontic anomaly seems to induce craniofacial adaptations.

Nevertheless, there are insufficient or low-quality data in the orthodontic literature to allow the formulation of clear statements regarding the influence of chin-cup treatment on the temporomandibular joint.

[\[The role of stabilization splint in the treatment of temporomandibular disorders.\]](#) [Article in Croatian]

Alajbeg I, Živković K, Gikić M.

Acta Med Croatica. 2015 Mar;69(1):33-43.

Stabilization splint is the treatment of choice for pain control in temporomandibular disorder (TMD) patients, even though its mechanism of action is still unknown. The aim of this systematic review is to provide a critical overview of the effectiveness of stabilization splint therapy on the basis of currently available literature data. The available Medline database was searched and 24 studies published since the 1990s have been consequently included in this review. The selection criteria were randomized controlled trials and clinical trials comparing splint therapy to either no treatment or another active treatment (physiotherapy, relaxation and drugs). Studies were grouped according to treatment type. Based on the currently best evidence available, it appears that stabilization splint has similar efficacy in controlling TMD symptoms as other active treatments (physiotherapy, relaxation and drugs). Stabilization splint therapy may be beneficial in reducing pain at rest and on palpation when compared with non-occluding splint. During a short period, education was slightly more effective than occlusal splint in treating spontaneous muscle pain. These two treatments did not have significantly different effects on pain-free mouth opening and pain during chewing. This review has shown evidence that most TMD patients are helped by incorporation of a stabilization splint. There is not enough data on the long-term efficacy and effectiveness of this widely used therapeutic tool. In the future, there is a need for well-conducted randomized controlled trials paying attention to adequate sample size, blind outcome assessment, duration of follow up, and using standardized methods for measuring treatment outcomes.

[The effectiveness of splint therapy in patients with temporomandibular disorders: a systematic review and meta-analysis.](#)

Ebrahim S, Montoya L, Busse JW, Carrasco-Labra A, Guyatt GH; Medically Unexplained Syndromes Research Group.

J Am Dent Assoc. 2012 Aug;143(8):847-57.

PURPOSE: The authors conducted a systematic review of all published randomized controlled trials in which investigators compared the effectiveness of splint therapy with that of minimal or no treatment in patients with temporomandibular disorders (TMDs). **TYPES OF STUDIES REVIEWED:** The authors searched MEDLINE, Embase and the Cochrane Central Register of Controlled Trials for studies published from inception of each database through August 2011. In eligible studies, investigators enrolled adult patients with TMDs and assigned them randomly to splint therapy or a control group receiving minimal or no treatment. **RESULTS:** Of 1,567 potentially eligible studies, 11 proved eligible and were included. Moderate-quality evidence suggests that splint therapy reduced pain in the temporomandibular joint (TMJ) area (standardized response mean = -0.93, 95 percent confidence interval [CI], -1.33 to -0.53; risk difference for having continued pain = -0.35, 95 percent CI, -0.21 to -0.46; mean change on the 100-millimeter visual analog scale = -11.5 mm, 95 percent CI, -16.5 mm to -6.6 mm). Low to very low quality of evidence showed no significant differences between the splint therapy and control groups in terms of quality of life or depression. None of the trial reports described effect on function. **CONCLUSIONS:** Although overall results are promising for the reduction of pain, establishing the role of splints for patients with TMDs will require large trials with stronger safeguards against bias.

[Systematic review and meta-analysis of randomized controlled trials evaluating intraoral orthopedic appliances for temporomandibular disorders.](#)

Fricton J, Look JO, Wright E, Alencar FG Jr, Chen H, Lang M, Ouyang W, Velly AM.

J Orofac Pain. 2010 Summer;24(3):237-54.

AIMS: To conduct a systematic review with meta-analysis of randomized controlled trials (RCTs) that have assessed the efficacy of intraoral orthopedic appliances to reduce pain in patients with temporomandibular disorders affecting muscle and joint (TMJD) compared to subjects receiving placebo control, no treatment, or other treatments. **METHODS:** A search strategy of MEDLINE, the Cochrane Library, the Cochrane CENTRAL Register, and manual search identified all English language publications of RCTs for intraoral appliance treatment of TMJD pain during the years of January 1966 to March 2006. Two additional studies from 2006 were added during the review process. Selection criteria included RCTs assessing the efficacy of hard and soft stabilization appliances, anterior positioning appliances, anterior bite appliances, and other appliance types for TMJD pain. Pain relief outcome measures were used in the meta-analyses, and the QUORUM criteria for data abstraction were used. A quality analysis of the methods of each RCT was conducted using the CONSORT criteria. The review findings were expressed both as a qualitative review and, where possible, as a mathematical synthesis using meta-analysis of results. **RESULTS:** A total of 47 publications citing 44 RCTs with 2,218 subjects were included. Ten RCTs were included in two meta-analyses. In the first meta-analysis of seven studies with 385 patients, a hard stabilization appliance was found to improve TMJD pain compared to non-occluding appliance. The overall odds ratio (OR) of 2.46 was statistically significant ($P = .001$), with a 95% confidence interval of 1.56 to 3.67. In the second meta-analysis of three studies including 216 patients, a hard stabilization appliance was found to improve TMJD pain compared to no-treatment controls. The overall OR of 2.15 was positive but not statistically significant, with a 95% confidence interval of 0.80 to 5.75. The quality (0 to 1) of the studies was moderate, with a mean of 55% of quality criteria being met, suggesting some susceptibility to systematic bias may have existed. **CONCLUSION:** Hard stabilization appliances, when adjusted properly, have good evidence of modest efficacy in the treatment of TMJD pain compared to non-occluding appliances and no treatment. Other types of appliances, including soft stabilization appliances, anterior positioning appliances, and anterior bite appliances, have some RCT evidence of efficacy in reducing TMJD pain. However, the potential for adverse events with these appliances is higher and suggests the need for close monitoring in their use.

[The NTI-tss device for the therapy of bruxism, temporomandibular disorders, and headache - where do we stand? A qualitative systematic review of the literature.](#)

Stapelmann H, Türp JC.

BMC Oral Health. 2008 Jul 29;8:22. doi: 10.1186/1472-6831-8-22.

BACKGROUND: The NTI-tss device is an anterior bite stop, which, according to the manufacturer, is indicated for the prevention and treatment of bruxism, temporomandibular disorders (TMDs), tension-type headaches, and migraine. The aim of this systematic review was to appraise the currently available evidence regarding the efficacy and safety of the NTI-tss splint. **METHODS:** We performed a systematic search in nine electronic databases and in NTI-tss-associated websites (last update: December 31, 2007). The reference lists of all relevant articles were perused. Five levels of scientific quality were distinguished. Reporting quality of articles about randomized controlled trials (RCTs) was evaluated using the Jadad score. To identify adverse events, we searched in the identified publications and in the MAUDE database. **RESULTS:** Nine of 68 relevant publications reported about the results of five different RCTs. Two RCTs concentrated on electromyographic (EMG) investigations in patients with TMDs and concomitant bruxism (Baad-Hansen et al 2007, Jadad score: 4) or with bruxism alone (Kavakli 2006, Jadad score: 2); in both studies, compared to an occlusal stabilization splint the NTI-tss device showed significant reduction of EMG activity. Two RCTs focused exclusively on TMD patients; in one trial (Magnusson et al 2004, Jadad score: 3), a stabilization appliance led to greater improvement than an NTI-tss device, while in the other study (Jokstad et al 2005, Jadad score: 5) no difference was found. In one RCT (Shankland 2002, Jadad score: 1), patients with tension-type headache or migraine responded more favorably to the NTI-tss splint than to a bleaching tray. NTI-tss-induced complications related predominantly to single teeth or to the occlusion. **CONCLUSION:** Evidence from RCTs suggests that the NTI-tss device may be successfully used for the management of bruxism and TMDs. However, to avoid potential unwanted effects, it should be chosen only if certain a patient will be compliant with follow-up appointments. The NTI-tss bite splint may be justified when a reduction of jaw closer muscle activity (e.g., jaw clenching or tooth grinding) is desired, or as an emergency device in patients with acute temporomandibular pain and, possibly, restricted jaw opening.

[Stabilization splint therapy for the treatment of temporomandibular myofascial pain: a systematic review.](#)

Al-Ani Z, Gray RJ, Davies SJ, Sloan P, Glenny AM.

J Dent Educ. 2005 Nov;69(11):1242-50.

The aim of this review is to establish the effectiveness of stabilization splint (SS) therapy in reducing symptoms in patients with myofascial pain. Searching of electronic databases, handsearching of relevant key journals, and screening of reference lists of included studies were undertaken. There was no language restriction, and unpublished research was sought. The selection criteria were randomized controlled trials comparing splint therapy to either no treatment or another active treatment. Data extraction and validity assessment were carried out independently and in duplicate. Studies were grouped according to treatment type. Twenty potentially relevant Randomized Controlled Trials (RCTs) were identified. Only twelve met the inclusion criteria. There is insufficient evidence either for or against the use of stabilization splint therapy over other active interventions for the treatment of temporomandibular myofascial pain. However, it appears that stabilization splint therapy may be beneficial for reducing pain severity at rest and on palpation and depression when compared to no treatment. The authors suggested the need for well conducted RCTs that pay attention to method of allocation, blind outcome assessment, sample size, and duration of follow-up. Various measures were adopted to assess the outcomes of treatment. Standardization of the methods used to measure outcomes of the treatment of myofascial pain should be established in future RCTs.

[Efficacy of stabilization splints for the management of patients with masticatory muscle pain: a qualitative systematic review.](#)

Türp JC, Komine F, Hugger A.

Clin Oral Investig. 2004 Dec;8(4):179-95.

This study aimed at providing an answer to two clinical questions related to patients with masticatory muscle pain: 1) Does the use of a full-coverage hard acrylic occlusal appliance (stabilization splint) lead to a significant decrease of symptoms? and 2) Is the treatment success achieved with a stabilization splint more pronounced than the success attained with other forms of treatment (including placebo treatment) or no treatment? A systematic search was carried out in different electronic databases, supplemented by handsearch in four selected dental journals and by examination of the bibliographies of the retrieved articles. Thirteen publications, representing nine controlled clinical studies, could be identified. Reporting quality of most studies as assessed with the Jadad score ranged from 1 to 5. Based on the currently best available evidence it appears that most patients with masticatory muscle pain are helped by the incorporation of a stabilization splint. Nevertheless, evidence is equivocal if improvement of pain symptoms after incorporation of the intraoral appliance is caused by a specific effect of the appliance. A stabilization splint does not appear to yield a better clinical outcome than a soft splint, a non-occluding palatal splint, physical therapy, or body acupuncture. The scarcity of current external evidence emphasizes the need for more and better clinical research.

[Application of principles of evidence-based medicine to occlusal treatment for temporomandibular disorders: are there lessons to be learned?](#)

Forssell H, Kalso E.

J Orofacial Pain. 2004 Winter;18(1):9-22; discussion 23-32.

Critical evaluation of treatment methods has become an important part of health care and will certainly have a major influence on decisions about acceptable treatment methods in the future. Evidence-based medicine (EBM) means the systematic, explicit, and judicious implementation of the best evidence in patient care. The most reliable sources of evidence are high-quality systematic reviews and randomized controlled trials (RCTs). A systematic EBM approach could be particularly useful in the treatment of temporomandibular disorders (TMD), where controversial and conflicting ideas about management are common. In this field, concerns about the lack of evidence are often expressed. This article aims to elucidate and discuss the application of EBM to the treatment of TMD, using the most controversial treatments (i.e., occlusal treatments) as an example. By applying the principles of EBM to TMD treatments, we wish to highlight some of the important issues that form the basis for high-quality care in this field. A systematic review of occlusal treatments (occlusal splints and occlusal adjustment) updated to January 2003 revealed 16 RCTs of occlusal splints and

4 of occlusal adjustment. The overall quality of the trials was fairly low. Recently, however, some high-quality RCTs of occlusal splints have been published. The most obvious methodologic shortcomings in published trials included problems in defining the patient population, inadequacies in performing randomization and blinding, problems in defining the therapies or appropriate control treatments, short follow-ups, and problems in monitoring patient compliance. Occlusal splint studies yielded equivocal results. Even in the most studied area, stabilization splints for myofascial face pain, the results do not justify definite conclusions about the efficacy of splint therapy. Their clinical effectiveness to relieve pain also seems modest when compared with pain treatment methods in general. None of the occlusal adjustment studies provided evidence supporting the use of this treatment method. The clinical implications of the findings and future perspectives are discussed.

[Occlusal stabilization appliances. Evidence of their efficacy.](#)

Kreiner M, Betancor E, Clark GT.

J Am Dent Assoc. 2001 Jun;132(6):770-7.

BACKGROUND: There is substantial controversy regarding the value of occlusal appliances for managing temporomandibular joint disorders. This article specifically assesses whether the evidence is sufficient to judge occlusal appliances as being efficacious for the management of localized masticatory myalgia, arthralgia or both. A major confounder is that few studies have measured or evaluated whether subjects had strong, ongoing parafunctional activity (such as clenching or grinding) and whether appliances influenced this behavior. **LITERATURE REVIEWED:** The authors evaluated four placebo-controlled studies, several randomized wait-list controlled studies and several random-assignment treatment-comparison studies. Data from the wait-list condition studies vs. those from the occlusal appliance condition studies consistently suggested that the latter treatment's effect on patient symptom level is far more than that of no treatment on a wait-list group's condition. In contrast, the studies on placebo-controlled vs. occlusal appliance studies yielded a mix of data: two showed a positive benefit of occlusal vs. nonoccluding appliances, and two showed a null effect or no difference. **CONCLUSIONS:** Considering all of the available data (pro and con), the authors conclude that the use of occlusal appliances in managing localized masticatory myalgia, arthralgia or both is sufficiently supported by evidence in the literature. **CLINICAL IMPLICATIONS:** The mechanism of action by which occlusal appliances affect localized myalgia and arthralgia probably is behavioral modification of jaw clenching. However, if the behavior continues unabated, even the best splint will not work.

[An evidence-based assessment of occlusal adjustment as a treatment for temporomandibular disorders.](#)

Tsukiyama Y, Baba K, Clark GT.

J Prosthet Dent. 2001 Jul;86(1):57-66.

STATEMENT OF PROBLEM: Occlusal adjustment therapy has been advocated as a treatment modality for temporomandibular disorders. In contrast to this position, a panel at the 1996 National Institute of Health technology assessment conference on TMD indicated that no clinical trials demonstrate that occlusal adjustment is superior to noninvasive therapies. **PURPOSE:** This article summarizes the published experimental studies on occlusal adjustments and temporomandibular disorders. **MATERIAL AND METHODS:** Eleven research experiments involving 413 subjects with either bruxism (n = 59), temporomandibular disorders (n = 219), headaches and temporomandibular disorders (n = 91), or chronic cervical pain (n = 40) were selected for critical review from the English dental literature. **RESULTS:** Three experiments evaluated the relationship between occlusal adjustment and bruxism. Six experiments evaluated occlusal adjustment therapy as a treatment for patients with primary temporomandibular disorders. One experiment looked at occlusal adjustment effect on headache/temporomandibular disorder symptoms; another looked at its effect on chronic neck pain. Most of these experiments used a mock adjustment or a comparison treatment as the control condition in adults who had an existing nonacute general temporomandibular disorder. Overall, the data from these experiments did not demonstrate elevated therapeutic efficacy for occlusal adjustment over the control or the contrasting therapy. **CONCLUSION:** The experimental evidence reviewed was neither convincing nor powerful enough to support the performance of occlusal therapy as a general method for treating a nonacute temporomandibular disorder, bruxism, or headache.

[Occlusal treatments in temporomandibular disorders: a qualitative systematic review of randomized controlled trials.](#)

Forssell H, Kalso E, Koskela P, Vehmanen R, Puukka P, Alanen P.

Pain. 1999 Dec;83(3):549-60.

Occlusal treatments (occlusal splints and occlusal adjustment) are controversial but widely used treatment methods for temporomandibular disorders (TMD). To investigate whether studies are in agreement with current clinical practices, a systematic review of randomized controlled trials (RCTs) of occlusal treatment studies from the period 1966 to March 1999 was undertaken. Eighteen studies met the inclusion criteria, 14 on splint therapy, and 4 on occlusal adjustment. The trials were scored using the quality scale presented by Antczak et al., 1986a (A.A. Antczak, J. Tang, T.C. Chalmers, Quality assessment of randomized control trials in dental research. I. Methods, J. Periodontal Res. 1986a;21:305-314). The overall quality of the trials was fairly low, the mean quality score was 0.43/1.00 (range 0.12-0.78). The most obvious methodological shortcomings were inadequate blinding, small sample sizes, short follow-up times, great diversity of outcome measures and numerous control treatments, some of unknown effectiveness. Splint therapy was found superior to 3, and comparable to 12 control treatments, and superior or comparable to 4 passive controls, respectively. Occlusal adjustment was found comparable to 2 and inferior to one control treatment and comparable to passive control in one study. Because of the methodological problems, only suggestive conclusions can be drawn. The use of occlusal splints may be of some benefit in the treatment of TMD. Evidence for the use of occlusal adjustment is lacking. There is an obvious need for well designed controlled studies to analyse the current clinical practices.

[Platelet-rich plasma for the therapeutic management of temporomandibular joint disorders: a systematic review.](#)

Bousnaki M, Bakopoulou A, Koidis P.

Int J Oral Maxillofac Surg. 2018 Feb;47(2):188-198. doi: 10.1016/j.ijom.2017.09.014.

This systematic review aimed to investigate whether intra-articular injections of platelet-rich plasma (PRP) are beneficial for the treatment of degenerative temporomandibular disorders, such as temporomandibular joint osteoarthritis (TMJ-OA) and disc displacement with osteoarthritic lesions, when compared to other treatments, such as injections of hyaluronic acid (HA) or saline. An electronic search of the MEDLINE and Scopus databases was performed using combinations of the terms "temporomandibular" and "platelet rich plasma", to identify studies reported in English and published up until May 2017. A hand-search of relevant journals and the reference lists of selected articles was also performed. The initial screening identified 153 records, of which only six fulfilled the inclusion criteria and were included in this review. Of these studies, three compared PRP with HA, while three compared PRP with Ringer's lactate or saline. Four of the studies found PRP injections to be superior in terms of improvements in mandibular range of motion and pain intensity up to 12 months after treatment, while the remaining two studies found similar results for the different treatments. There is slight evidence for the potential benefits of intra-articular injections of PRP in patients with TMJ-OA. However, a standardized protocol for PRP preparation and application needs to be established.

[Effectiveness of intra-articular injections of sodium hyaluronate or corticosteroids for intracapsular temporomandibular disorders: A systematic review and meta-analysis.](#)

Moldez MA, Camones VR, Ramos GE, Padilla M, Enciso R.

J Oral Facial Pain Headache. Winter 2018;32(1):53-66. doi: 10.11607/ofph.1783.

AIMS: To assess the effectiveness of intra-articular injections of sodium hyaluronate (NaH) or corticosteroids (CS) for treatment of intracapsular temporomandibular disorders (TMD). METHODS: Single- or double-blinded randomized controlled trials (RCTs) on the effectiveness of NaH or CS injections, compared to each other or to placebo, for the treatment of intracapsular TMD due to osteoarthritis and/or internal joint derangement were analyzed in this systematic review and meta-analysis. Electronic searches of MEDLINE through the PubMed, Web of Science, and Cochrane Library databases were conducted on March 17, 2015, and an updated search was conducted on June 7, 2017. Three reviewers independently extracted the data and assessed the risk of bias of included studies. RESULTS: An initial search yielded 245 studies, and 5 additional studies were identified through cross referencing. A total of 22 studies were identified as relevant based on the abstracts, but only 7 RCTs met the inclusion criteria. Six of the included studies had unclear risk of bias, and one had high risk of bias. Four studies were eligible for meta-analysis. Pooled results showed no significant difference in short- or long-term pain improvement with NaH compared to CS. The number of responders to NaH was significantly more than placebo in one study, but not significantly higher than CS in another study. CONCLUSION: Although there was no significant difference between the effectiveness of NaH and CS intra-articular injections, there was some evidence that NaH was better than placebo. Further research is needed to determine the minimum effective dose and long-term side effects of both injections.

[A systematic review of different substance injection and dry needling for treatment of temporomandibular myofascial pain.](#)

Machado E, Machado P, Wandscher VF, Marchionatti AME, Zanatta FB, Kaizer OB.

Int J Oral Maxillofac Surg. 2018 Nov;47(11):1420-1432. doi: 10.1016/j.ijom.2018.05.003.

Temporomandibular myofascial pain presents a major challenge in the diagnosis of temporomandibular disorders (TMD). Due to the characteristics of this condition, intramuscular injection procedures are often needed for adequate control of symptoms and treatment. Thus, the aim of this systematic review was to evaluate the effectiveness of dry needling and injection with different substances in temporomandibular myofascial pain. Electronic databases PubMed, EMBASE, CENTRAL/Cochrane, Lilacs, Scopus, Web of Science and CAPES Catalog of Dissertations and Theses were searched for randomized clinical trials until January 2018. Manual search was performed in relevant journals and in the references/citations of the included studies. The selection of studies was carried out by two independent reviewers according to eligibility criteria. From 7128 eligible studies, 137 were selected for full-text analysis and 18 were included. Due to the heterogeneity of the primary studies it was not possible to perform a meta-analysis. The narrative analysis of the results showed that most of the studies had methodological limitations and biases that compromised the quality of the findings. Dry needling and local anaesthetic injections seem promising, but there is a need to conduct further randomized clinical trials, with larger samples and longer follow-up times, to evaluate the real effectiveness of the technique and evaluated substances.

[Efficacy of viscosupplementation with hyaluronic acid in temporomandibular disorders: A systematic review.](#)

Ferreira N, Masterson D, Lopes de Lima R, de Souza Moura B, Oliveira AT, Kelly da Silva Fidalgo T, Carvalho ACP, DosSantos MF, Grossmann E.

J Craniomaxillofac Surg. 2018 Nov;46(11):1943-1952. doi: 10.1016/j.jcms.2018.08.007.

OBJECTIVE: To perform a systematic review of the viscosupplementation effectiveness with hyaluronic acid (HA) in the articular Temporomandibular Dysfunctions (TMDs) clinical management. METHOD: Electronic searches were performed in the following databases: MEDLINE (via PubMed), Scopus, Web of Science, Cochrane Library, EMBASE, LILACS, BBO, SIGLE (System for Information on Grey Literature in Europe), ClinicalTrials.gov, and the Brazilian Clinical Trials Registry (ReBec). Only randomized clinical trials that evaluated the intra-articular administration of HA or its derivatives in osteoarthritis and/or anterior displacement of the temporomandibular joint (TMJ) disc were included. The primary outcomes evaluated were patients' self-report of pain and/or discomfort in the TMJ. Each study was assessed for the risk of bias, using the Cochrane collaboration's risk of bias tool. RESULTS: A total of 640 studies were obtained in the electronic search. After the application of the eligibility criteria, manual search, and duplicate removal, 21 articles were included. Five articles classified their volunteers with internal derangements of the TMJ, in 4 articles the treatment was directed to participants with disc displacement with reduction and the other articles evaluated HA therapy in osteoarthritis. The

protocols presented heterogeneity, varying in the form of application, associated or not with arthrocentesis, number of applications, molecular weight, dose and concentration. Nine studies presented high risk of bias. CONCLUSION: Due to the heterogeneity and methodological inconsistencies of the studies evaluated, it was not possible to establish the efficacy of HA in articular TMDs.

[Effect of hyaluronic acid on the regulation of inflammatory mediators in osteoarthritis of the temporomandibular joint: a systematic review.](#)

Iturriaga V, Bornhardt T, Manterola C, Brebi P.

Int J Oral Maxillofac Surg. 2017 May;46(5):590-595. doi: 10.1016/j.ijom.2017.01.014.

Osteoarthritis is one of the most frequent pathologies affecting the temporomandibular joint (TMJ). There is evidence that the use of intra-articular hyaluronic acid (HA) for the treatment of this disorder achieves positive effects through a reduction in inflammatory mediators. A systematic review of the available evidence regarding the regulation of inflammatory mediators when applying HA in osteoarthritis of the TMJ in humans was performed. The Web of Science, Embase, ScienceDirect, MEDLINE, Scopus, EBSCOhost, and LILACS databases, SciELO library, and search engine Trip Database were searched systematically. Two thousand eight hundred and sixty-three related articles were found, of which only two met the selection criteria (both were clinical trials and evidence level 2b for treatment studies). These two articles represented a population of 87 patients. Both articles reported that the application of HA had a positive effect on the regulation of inflammatory mediators; the mediators studied were those of the plasminogen activator system and levels of nitric oxide. The limited evidence available suggests that the application of HA regulates various inflammatory mediators in osteoarthritic processes in the TMJ. Nevertheless, further evidence in this regard is required, through the study of specific pathologies of the TMJ, complementing the assessment of clinical parameters with molecular studies, and generating good quality clinical studies with larger sample sizes.

[Are intra-articular injections of hyaluronic acid effective for the treatment of temporomandibular disorders? A systematic review.](#)

Goiato MC, da Silva EV, de Medeiros RA, Túrcio KH, Dos Santos DM.

Int J Oral Maxillofac Surg. 2016 Dec;45(12):1531-1537. doi: 10.1016/j.ijom.2016.06.004.

This systematic review aimed to investigate whether intra-articular injections of hyaluronic acid (HA) are better than other drugs used in temporomandibular joint arthrocentesis, for the improvement of temporomandibular disorder (TMD) symptoms. Two independent reviewers performed an electronic search of the MEDLINE and Web of Science databases for relevant studies published in English up to March 2016. The key words used included a combination of 'hyaluronic acid', 'viscosupplementation', 'intra-articular injections', 'corticosteroids', or 'non steroidal anti inflammatory agents' with 'temporomandibular disorder'. Selected studies were randomized clinical trials and prospective or retrospective studies that primarily investigated the application of HA injections compared to other intra-articular medications for the treatment of TMD. The initial screening yielded 523 articles. After evaluation of the titles and abstracts, eight were selected. Full texts of these articles were accessed and all fulfilled the inclusion criteria. Intra-articular injections of HA are beneficial in improving the pain and/or functional symptoms of TMDs. However, other drug therapies, such as corticosteroid and non-steroidal anti-inflammatory drug injections, can be used with satisfactory results. Well-designed clinical studies are necessary to identify an adequate protocol, the number of sessions needed, and the appropriate molecular weight of HA for use.

[Botulinum toxin therapy for temporomandibular joint disorders: a systematic review of randomized controlled trials.](#)

Chen YW, Chiu YW, Chen CY, Chuang SK.

Int J Oral Maxillofac Surg. 2015 Aug;44(8):1018-26. doi: 10.1016/j.ijom.2015.04.003.

The objective of this study was to undertake a systematic review to assess the efficacy of botulinum toxin therapy (BTX) for temporomandibular joint disorders (TMDs). A comprehensive search of major databases through PubMed, EMBASE, and Cochrane CENTRAL was conducted to locate all relevant articles published from inception to October 2014. Eligible studies were selected based on inclusion criteria and included English language, peer-reviewed publications of randomized controlled trials comparing BTX versus any alternative intervention or placebo. Quality assessment and data extraction were done according to the Cochrane risk of bias tool and recommendations. The entire systematic search and selection process was done independently by two reviewers. Five relevant study trials were identified, involving 117 participants. Two trials revealed a significant between-group difference in myofascial pain reduction, another trial that compared BTX with fascial manipulation showed equal efficacy of pain relief on TMDs, while the remaining two trials showed no significant difference between the BTX and placebo groups. Because of considerable variations in study methods and evaluation of results, a meta-analysis could not be performed. Based on this review, no consensus could be reached on the therapeutic benefits of BTX on TMDs. A more rigorous design of trials should be carried out in future studies.

[Intra-articular injections with corticosteroids and sodium hyaluronate for treating temporomandibular joint disorders: a systematic review.](#)

Machado E, Bonotto D, Cunali PA.

Dental Press J Orthod. 2013 Sep-Oct;18(5):128-33

INTRODUCTION: In some cases, conservative treatment of internal derangements of the Temporomandibular Joint (TMJ) is considered little responsive. Thus, it is necessary to accomplish treatments that aim at reducing pain and improve function in patients who present arthogenic temporomandibular disorders. OBJECTIVE: This study, by means of a systematic review of the literature, aimed to analyze the effectiveness of intra-articular injections with corticosteroids and sodium hyaluronate for treating internal derangements of the TMJ. METHODS: Carry out a research in the following databases: MEDLINE, Cochrane, EMBASE, Pubmed, Lilacs, and BBO, considering publications issued between 1966 and October 2010, focusing on randomized or quasi-randomized controlled clinical trials, single or double-blind. RESULTS: After applying the inclusion criteria we collected 9 articles, 7 of which were randomized controlled double-blind clinical trials and 2 randomized controlled single-blind clinical trials. CONCLUSION: After analyzing the literature, it was found that intra-articular injection with corticosteroids and sodium hyaluronate seems to be an effective method for treating internal derangements of the TMJ. However, further randomized controlled clinical trials, with representative samples and longer follow-up time must be carried out in order to assess the real effectiveness of this technique.

[Inferior or double joint spaces injection versus superior joint space injection for temporomandibular disorders: a systematic review and meta-analysis.](#)

Li C, Zhang Y, Lv J, Shi Z.

J Oral Maxillofac Surg. 2012 Jan;70(1):37-44. doi: 10.1016/j.joms.2011.04.009.

PURPOSE: To compare the effect and safety of inferior or double temporomandibular joint spaces drug injection versus superior temporomandibular joint space injection in the treatment of temporomandibular disorders. **MATERIALS AND METHODS:** MEDLINE (via Ovid, 1948 to March 2011), CENTRAL (Issue 1, 2011), Embase (1984 to March 2011), CBM (1978 to March 2011), and World Health Organization International Clinical Trials Registry Platform were searched electronically; relevant journals as well as references of included studies were hand-searched for randomized controlled trials comparing effect or safety of inferior or double joint spaces drug injection technique with those of superior space injection technique. Risk of bias assessment with the tool recommended by Cochrane Collaboration, reporting quality assessment with CONSORT and data extraction, were carried out independently by 2 reviewers. Meta-analysis was delivered with RevMan 5.0.23. **RESULTS:** Four trials with 349 participants were included. All the included studies had moderate risk of bias. Meta-analysis showed that inferior or double spaces injection technique could significantly increase 2.88 mm more maximal mouth opening ($P = .0001$) and alleviate pain intensity in the temporomandibular area on average by 9.01 mm visual analog scale scores ($P = .0001$) compared with superior space injection technique, but could not markedly change synthesized clinical index ($P = .05$) in the short term; nevertheless, they showed more beneficial maximal mouth opening ($P = .002$), pain relief ($P < .0001$), and synthesized clinical variable ($P < .0001$) in the long term than superior space injection. No serious adverse events were reported. **CONCLUSIONS:** Inferior or double temporomandibular joint spaces drug injection technique shows better effect than superior space injection technique, and their safety is affirmative. However, more high-quality studies are still needed to test and verify the evidence.

[Hyaluronic acid in the treatment of TMJ disorders: a systematic review of the literature.](#)

Manfredini D, Piccotti F, Guarda-Nardini L.

Cranio. 2010 Jul;28(3):166-76.

Hyaluronate acid (HA) injections are gaining attention as a treatment option to manage symptoms of temporomandibular joint (TMJ) disorders, but updated evidence-based data on their effectiveness are actually lacking. The present paper aims to summarize and review systematically the clinical studies on the use of hyaluronic acid injections to treat TMJ disorders performed over the last decade. On November 9, 2009, a systematic search in the National Library of Medicine's PubMed (<http://www.ncbi.nlm.nih.gov/pubmed>) database was performed by means of a combined MeSH and word terms to identify all peer-reviewed papers published in the English literature dealing with the hyaluronic acid infiltration in patients affected by TMJ disorders. The selected papers were assessed according to a structured reading of articles format, which provided that the study design was methodologically evaluated in relation to four main issues, viz., population, intervention, comparison, and outcome. Nineteen (N=19) papers were selected for inclusion in the review, twelve (N=12) dealt with the use of hyaluronic acid in TMJ disk displacements and seven (N=7) dealt with inflammatory-degenerative disorders. Only nine groups of researchers were involved in the studies, and less than half of the studies (8/19) were randomized and controlled trials (RCTs). All studies reported a decrease in pain levels independently by the patients' disorder and by the adopted injection protocol. Positive outcomes were maintained over the follow-up period, which was varied among studies, ranging between 15 days and 24 months. The superiority of HA injections was shown only against placebo saline injections, but outcomes are comparable with those achieved with corticosteroid injections or oral appliances. The available literature seems to be inconclusive as to the effectiveness of HA injections with respect to other therapeutic modalities in treating TMJ disorders. Studies with a better methodological design are needed to gain better insight into this issue and to draw clinically useful information on the most suitable protocols for each different TMJ disorder.

Abstracts: Dry Needling

[The effectiveness of dry needling for patients with orofacial pain associated with temporomandibular dysfunction: a systematic review and meta-analysis.](#)

Vier C, Almeida MB, Neves ML, Santos ARSD, Bracht MA.

Braz J Phys Ther. 2019 Jan - Feb;23(1):3-11. doi: 10.1016/j.bjpt.2018.08.008.

BACKGROUND: Orofacial pain of myofascial origin is often associated with temporomandibular joint dysfunction, affects chewing muscles and may lead to functional limitations. Dry needling is an intervention commonly used for inactivating myofascial pain trigger points. **OBJECTIVE:** To systematically review the effects of dry needling on orofacial pain of myofascial origin in patients with temporomandibular joint dysfunction. **METHODS:** This systematic review has pain intensity as primary outcome. Searches were conducted on April 13th, 2018 in eight databases, without publication date restrictions. We selected randomized controlled trials published in English, Portuguese, or Spanish, with no restrictions regarding subject ethnicity, age or sex. **RESULTS:** 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. **CONCLUSION:** Clinicians can use dry needling for the treatment of temporomandibular joint dysfunction, nevertheless, due the low quality of evidence and high risk of bias of some included studies, larger and low risk of bias trials are needed to assess the effects of dry needling on orofacial pain associated with temporomandibular joint dysfunction.

[A systematic review of different substance injection and dry needling for treatment of temporomandibular myofascial pain.](#)

Machado E, Machado P, Wandscher VF, Marchionatti AME, Zanatta FB, Kaizer OB.
Int J Oral Maxillofac Surg. 2018 Nov;47(11):1420-1432. doi: 10.1016/j.ijom.2018.05.003.

Temporomandibular myofascial pain presents a major challenge in the diagnosis of temporomandibular disorders (TMD). Due to the characteristics of this condition, intramuscular injection procedures are often needed for adequate control of symptoms and treatment. Thus, the aim of this systematic review was to evaluate the effectiveness of dry needling and injection with different substances in temporomandibular myofascial pain. Electronic databases PubMed, EMBASE, CENTRAL/Cochrane, Lilacs, Scopus, Web of Science and CAPES Catalog of Dissertations and Theses were searched for randomized clinical trials until January 2018. Manual search was performed in relevant journals and in the references/citations of the included studies. The selection of studies was carried out by two independent reviewers according to eligibility criteria. From 7128 eligible studies, 137 were selected for full-text analysis and 18 were included. Due to the heterogeneity of the primary studies it was not possible to perform a meta-analysis. The narrative analysis of the results showed that most of the studies had methodological limitations and biases that compromised the quality of the findings. Dry needling and local anaesthetic injections seem promising, but there is a need to conduct further randomized clinical trials, with larger samples and longer follow-up times, to evaluate the real effectiveness of the technique and evaluated substances.

Abstracts: Psychosocial / Behavioral Interventions / Biofeedback

[The Effectiveness of Noninvasive Interventions for Temporomandibular Disorders: A Systematic Review by the Ontario Protocol for Traffic Injury Management \(OPTIMa\) Collaboration.](#)

Randhawa K, Bohay R, Côté P, van der Velde G, Sutton D, Wong JJ, Yu H, Southerst D, Varatharajan S, Mior S, Stupar M, Shearer HM, Jacobs C, Taylor-Vaisey A.

Clin J Pain. 2016 Mar;32(3):260-78. doi: 10.1097/AJP.0000000000000247.

OBJECTIVE: To determine the effectiveness and cost-effectiveness of noninvasive interventions for temporomandibular disorders (TMD). **METHODS:** We systematically searched MEDLINE, EMBASE, CINAHL, PsycINFO, and Cochrane Central register from 1990 to 2014 for effectiveness studies and the Cochrane Health Technology Assessment Database, EconLit, NHS Economic Evaluation Database, and Tufts Medical Center Cost-Effectiveness Analysis Register from 1990 to 2014 for cost-effectiveness studies. Random pairs of independent reviewers critically appraised eligible studies using the Scottish Intercollegiate Guidelines Network criteria. Evidence from eligible studies was synthesized using best-evidence synthesis methodology. **RESULTS:** Our search for effectiveness studies yielded 16,995 citations; 31 were relevant and 7 randomized controlled trials (published in 8 articles) had a low risk of bias. We found no relevant cost-effectiveness studies. The evidence suggests that for persistent TMD: (1) cognitive-behavioral therapy and self-care management lead to similar improvements in pain and disability but cognitive-behavioral therapy is more effective for activity interference and depressive symptoms; (2) cognitive-behavioral therapy combined with usual treatment provides short-term benefits in pain and ability to control pain compared with usual treatment alone; (3) intraoral myofascial therapy may reduce pain and improve jaw opening; and (4) structured self-care management may be more effective than usual treatment. The evidence suggests that occlusal devices may not be effective in reducing pain and improving motion for TMD of variable duration. Evidence on the effectiveness of biofeedback is inconclusive. **DISCUSSION:** The available evidence suggests that cognitive-behavioral therapy, intraoral myofascial therapy, and self-care management are therapeutic options for persistent TMD.

[Self-management in temporomandibular disorders: a systematic review of behavioural components.](#)

Story WP, Durham J, Al-Baghdadi M, Steele J, Araujo-Soares V.
J Oral Rehabil. 2016 Oct;43(10):759-70. doi: 10.1111/joor.12422.

The aim of this qualitative systematic review was to identify the behaviour change techniques most frequently employed in published temporomandibular disorder (TMD) self-management (SM) programmes. The reviewers matched the components of SM programmes into the relevant behaviour change technique domains according to the definitions of the behaviour change taxonomy (version 1). Electronic databases were searched for randomised controlled trials assessing an SM programme for TMD. Manual searches were also conducted for potentially important journals. Eligibility criteria for the review included: the type of study, the participants, the intervention utilised and the comparators/control. Fifteen randomised controlled trials with 554 patients were included in this review. The review concludes a minority of the available behaviour change techniques are currently employed in SM programmes. Other behaviour change techniques should be examined to see whether there is a theoretical underpinning that might support their inclusion in self-management programmes in TMD. Further trials are required to conclude that SM programmes are more effective than no treatment at all and or placebo. With more structured SM programmes, greater therapeutic benefits might be achieved, and certainly if SM programmes published in the literature define their components through use of the behaviour change taxonomy, it would be easier for clinicians to replicate efficacious programmes.

[Tailored treatments in temporomandibular disorders: where are we now? A systematic qualitative literature review.](#)

Kotiranta U, Suvinen T, Forssell H.
J Oral Facial Pain Headache. 2014 Winter;28(1):28-37. doi: 10.11607/jop.1121.

AIMS: To conduct a systematic review to evaluate the evidence of possible benefits of tailored treatments for temporomandibular disorders (TMD) based on randomized controlled trials (RCTs). **METHODS:** Reports of RCTs investigating treatments tailored to TMD patients' psychosocial characteristics were systematically searched for through March 2013 in the following databases: Cochrane Central Register of Controlled Trials, PubMed, and Web of Science. The methodological quality of the RCTs was assessed using the Cochrane Collaboration's tool for assessing risk of bias.

RESULTS: Seven reports met the inclusion criteria. In all studies a subgroup of TMD patients, mainly identified by multidimensional diagnostic systems such as the Research Diagnostic Criteria for TMD Axis II or Multidimensional Pain Inventory, were offered a treatment intervention hypothesized to be suitable for that particular patient group. The quality of the trials was compromised in all cases. Two studies focused on well-functioning TMD patients. In both studies, self-care gave results equal to or better than usual conservative TMD treatment. The treatments were targeted for patients with compromised psychosocial adaptation in five studies, and typically included a cognitive behavioral treatment component. In all trials the results supported the efficacy of tailored treatment, albeit in one trial only in the short-term. CONCLUSION: The identified studies offer cautious support to the notion that treatment targeted to different psychosocial subgroups of TMD pain patients may be beneficial.

[A systematic review and meta-analysis of usual treatment versus psychosocial interventions in the treatment of myofascial temporomandibular disorder pain.](#)

Roldán-Barraza C, Janko S, Villanueva J, Araya I, Lauer HC.
J Oral Facial Pain Headache. 2014 Summer;28(3):205-22. doi: 10.11607/ofph.1241.

AIMS: To carry out a systematic review and meta-analysis comparing the effects of occlusal splint therapy ("usual treatment") and psychosocial interventions for the treatment of myofascial temporomandibular disorder (TMD) pain in adult patients. METHODS: Independent screening and evaluation of randomized clinical trials included comparisons between "usual treatment" based on splint therapy and psychosocial interventions for TMD treatment within electronic databases (PubMed/MEDLINE, CENTRAL, EMBASE), ongoing trials databases (Current Controlled Trials, ClinicalTrials.gov), and additional sources. The outcomes selected for the systematic review were self-reported pain, pain interference, unassisted jaw opening without pain, muscle pain upon palpation, depression, and somatization. The effect measures were analyzed using a random-effect model (Review Manager computer program). RESULTS: The outcomes "long-term self-reported pain" and "long-term depression" were significantly different for the comparisons of "usual treatment" and psychosocial interventions, and they favored the latter ($P < .005$ and $P < .05$, respectively). These results must be viewed with caution due to the limited number of studies available. A tendency toward greater improvements of psychological outcomes was observed for psychosocial interventions, while physical functioning was slightly more responsive to "usual treatment." CONCLUSION: No evidence was found to distinguish the clinical effectiveness between "usual treatment" and psychosocial interventions for myofascial TMD pain. Future studies of TMD and related subdiagnoses should be reported according to core standardized outcomes to facilitate comparisons.

[Counselling and self-management therapies for temporomandibular disorders: a systematic review.](#)

de Freitas RF, Ferreira MÂ, Barbosa GA, Calderon PS.
J Oral Rehabil. 2013 Nov;40(11):864-74. doi: 10.1111/joor.12098.

The aim of this review was to investigate the effectiveness of counselling and other self-management-based therapies on muscle and temporomandibular joint (TMJ) pain relief and increasing the functional abilities of patients with temporomandibular disorders (TMD). A systematic literature review was conducted by three independent reviewers and included articles published up to 2012. PubMed and Cochrane Library electronic databases were used in addition to hand-searching to assess clinical outcomes for counselling and self-management approaches for TMD treatment. The review yielded 581 records that were narrowed down to 7. All included studies were classified as blind-randomized controlled clinical trials. The selected articles analysed revealed that counselling was able to improve tenderness upon masticatory muscle palpation and maximum mouth opening with and without pain in patients with TMD, with similar results to those of interocclusal appliances approaches. Thus, counselling- and self-management-based therapies could be considered a conservative low-cost and beneficial treatment alternative for treating TMD to potentially improve psychological domains and remove harmful behaviours for the control of the signs and symptoms of TMD.

[The effectiveness of cognitive-behavioural therapy for temporomandibular disorders: a systematic review.](#)

Liu HX, Liang QJ, Xiao P, Jiao HX, Gao Y, Ahmetjiang A.
J Oral Rehabil. 2012 Jan;39(1):55-62. doi: 10.1111/j.1365-2842.2011.02239.x.

Cognitive-behavioural therapy (CBT) and its effects on temporomandibular disorders (TMD) have been examined in several studies. We are trying to combine results of these studies and to explore the effectiveness. MEDLINE, EMBASE, Cochrane Central Register of Controlled Trial, Pubmed and the Chinese Biomedical Literature Data were searched to collect randomised and semi-randomised controlled trials (RCTs), comparing CBT with any control group receiving other dental treatments. Two authors independently retrieved, extracted and assessed the quality of included studies. The search strategy resulted in 323 studies, of which five met the inclusion criteria, including three RCTs and two semi-RCTs. The quality of the included studies was diverse. Meta-analysis was not performed owing to five studies involving different comparison groups and follow-up periods. The effect of CBT on patients with TMD is inconsistent among the studies, so no firm conclusion could be drawn in this systematic review. There is insufficient evidence to make firm recommendations for the use of CBT over other intervention for the treatment of TMD. Further high-quality RCTs are clearly needed for this theme.

[Efficacy of biofeedback-based treatments for temporomandibular disorders.](#)

Crider A, Glaros AG, Gevirtz RN.
Appl Psychophysiol Biofeedback. 2005 Dec;30(4):333-45.

Bibliographic searches identified 14 controlled and uncontrolled outcome evaluations of biofeedback-based treatments for temporomandibular disorders published since 1978. This literature includes two randomized controlled trials (RCTs) of each of three types of biofeedback treatment: (1) surface electromyographic (SEMG) training of the masticatory muscles, (2) SEMG training combined with adjunctive cognitive-behavioral therapy (CBT) techniques, and (3) biofeedback-assisted relaxation training (BART). A detailed review of these six RCTs, supplemented with information from non-RCT findings, was conducted to determine the extent to which each type of intervention met treatment efficacy criteria promulgated by the Association for Applied Psychophysiology and Biofeedback (AAPB). We conclude that SEMG training with adjunctive CBT is an

efficacious treatment for temporomandibular disorders and that both SEMG training as the sole intervention and BART are probably efficacious treatments. We discuss guidelines for designing and reporting research in this area and suggest possible directions for future studies.

[A meta-analysis of EMG biofeedback treatment of temporomandibular disorders.](#)

Crider AB, Glaros AG.

J Orofac Pain. 1999 Winter;13(1):29-37.

AIMS: Outcome evaluations of treatments incorporating electromyographic (EMG) biofeedback for temporomandibular disorders (TMD) have been conducted for more than 2 decades. The purpose of this study was to review the available literature to determine the efficacy of biofeedback-based treatments and to estimate treatment effect sizes. METHODS: A literature search located 13 studies of EMG biofeedback treatment for TMD, including 6 controlled, 4 comparative treatment, and 3 uncontrolled trials. Three types of outcome were examined: patient pain reports, clinical exam findings, and ratings of global improvement. RESULTS: Five of the 6 controlled trials found EMG biofeedback treatments to be superior to no treatment or psychologic placebo controls for at least 1 of the 3 types of outcome. Data from 12 studies contributed to a meta-analysis that compared pre- to posttreatment effect sizes for EMG biofeedback treatments to effect sizes for control conditions. Mean effect sizes for both reported pain and clinical exam outcomes were substantially larger for biofeedback treatments than for control conditions. In addition, 69% of patients who received EMG biofeedback treatments were rated as symptom-free or significantly improved, compared with 35% of patients treated with a variety of placebo interventions. Follow-up outcomes for EMG biofeedback treatments showed no deterioration from posttreatment levels.

Abstracts: Brain Stimulation

[Non-invasive brain stimulation in chronic orofacial pain: a systematic review.](#)

Herrero Babiloni A, Guay S, Nixdorf DR, de Beaumont L, Lavigne G.

J Pain Res. 2018 Aug 1;11:1445-1457. doi: 10.2147/JPR.S168705. eCollection 2018.

BACKGROUND: Transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS) are non-invasive brain stimulation techniques that are being explored as therapeutic alternatives for the management of various chronic pain conditions. OBJECTIVE: The primary objective of this systematic review is to assess the efficacy of TMS and tDCS in reducing clinical pain intensity in chronic orofacial pain (OFP) disorders. The secondary objectives are to describe adverse effects, duration of relief, and TMS/tDCS methodologies used in chronic OFP disorders. METHODS: A search was performed in MEDLINE, Embase, Web of Science, Scopus, and Google Scholar. Inclusion criteria were 1) population: adults diagnosed with chronic OFP including neuropathic and non-neuropathic disorders; 2) intervention: active TMS or tDCS stimulation regardless of the used protocol; 3) comparison: sham TMS or tDCS stimulation; and 4) outcome: primary outcome was patient reported pain intensity. Secondary outcomes were duration of pain relief, adverse effects, and methodological parameters. Risk of bias and quality of study reporting were also assessed. RESULTS: A total of 556 individual citations were identified by the search strategy, with 14 articles meeting selection criteria (TMS=11; tDCS=3). Data were obtained for a total of 228 patients. Included OFP disorders were trigeminal neuralgia, trigeminal neuropathy, burning mouth syndrome, atypical facial pain, and temporomandibular disorders. Significant pain reductions were obtained in both techniques. More number of sessions yielded to more durable effects. Overall, high risk of bias and poor study quality were found. CONCLUSION: TMS and tDCS appear to be safe and promising alternatives to reduce pain intensity in different chronic OFP disorders. Additional research effort is needed to reduce bias, improve quality, and characterize optimal brain stimulation parameters to promote their efficacy.

Abstracts: Pediatric Populations

[Prevalence and treatment strategies regarding temporomandibular disorders in children and adolescents-A systematic review.](#)

Christidis N, Lindström Ndanshau E, Sandberg A, Tsilingaridis G.

J Oral Rehabil. 2019 Mar;46(3):291-301. doi: 10.1111/joor.12759.

AIMS: Temporomandibular disorders (TMD) in children/adolescents are very common. Yet, there is a lack of consensus regarding which clinical interventions are appropriate. The aim of this systematic review was to gather and assess the quality of the available literature on the prevalence and evidence-based treatment strategies in children and adolescents suffering from TMD. METHODS: A systematic literature review was conducted including articles from 1992 to 2016. A total of 2293 articles were found. Eight were included, six regarding prevalence and two regarding treatment. Simple or multiple conjunctions of different search words: "temporomandibular disorder", "temporomandibular joint disorder", "prevalence", "children" "adolescents", "occlusal appliance", "jaw exercise" and "relaxation" were used on the databases PubMed and Web of Science. Inclusion criteria were (a) scientific articles or randomised controlled clinical trials evaluating prevalence, choice of therapy and treatment outcome for children and/or adolescents with TMD published in Swedish or English and (b) a TMD diagnosis according to the Research Diagnostic Criteria for TMD or Diagnostic Criteria for TMD. RESULTS: Prevalence (ages 10-19 years) varied between 7.3 and 30.4%, and the most common diagnoses were myofascial pain and anterior disc displacement with reduction. Only two articles were found regarding treatment in adolescents (ages 12-18 years). The stabilising occlusal appliance had superior treatment outcome compared to relaxation therapy or brief information. CONCLUSION: The general absence of standardised studies concerning children/adolescents with TMD pain states the evident need for further systematic prevalence and treatment evaluations. Considering this, it is not possible to achieve any evidence-based treatment strategies or guidelines for children and adolescents with TMD.

[Outcome of orthodontic palatal plate therapy for orofacial dysfunction in children with Down syndrome: A systematic review.](#)

Javed F, Akram Z, Barillas AP, Kellesarian SV, Ahmed HB, Khan J, Almas K.
Orthod Craniofac Res. 2018 Feb;21(1):20-26. doi: 10.1111/ocr.12211.

To evaluate the effects of orthodontic palatal plate therapy (OPPT) in the treatment of orofacial dysfunction in children with Down syndrome (DS). Indexed databases were searched. Clinical trials in DS allocated to test (treatment with palatal plates) versus control group (without palatal plates/special physiotherapy for orofacial stimulation) with follow-up of any time duration and assessing mouth closure, tongue position, active and inactive muscle function as outcomes. Study designs, subject demographics, frequency and duration of palatal plate therapy, method for assessment, follow-up period and outcomes were reported according to the PRISMA guidelines. Eight clinical studies were included. The risk of bias was considered high in three studies and moderate in 5 studies. The number of children with DS ranged between 9 and 42. The mean age of children with DS at the start of the study ranged between 2 months and 12 years. The duration of palatal plate therapy ranged between 4 months and 48 months. The follow-up period in all studies ranged from 12 to 58 months. All studies reported OPPT to be effective in improving orofacial disorders in children with DS. Most of the included studies suggest that palatal plate therapy in combination with physiotherapy/orofacial regulation therapy according to Castillo Morales/speech and language intervention seems to be effective in improving orofacial disorders in children with DS. However, the risk of bias of the included studies was high to moderate. Longitudinal trials with standardized evaluation methods, age of children at treatment initiation, treatment duration and standard orofacial outcomes are recommended.

Abstracts: Scientific Rigor in TMD Trials

[Reporting of adverse events and statistical details of efficacy estimates in randomized clinical trials of pain in temporomandibular disorders: Analgesic, Anesthetic, and Addiction Clinical Trial Translations, Innovations, Opportunities, and Networks systematic review.](#)

Gewandter JS, Smith SM, McKeown A, Edwards K, Narula A, Pawlowski JR, Rothstein D, Desjardins PJ, Dworkin SF, Gross RA, Ohrbach R, Rappaport BA, Sessle BJ, Turk DC, Dworkin RH.
J Am Dent Assoc. 2015 Apr;146(4):246-54.e6. doi: 10.1016/j.adaj.2014.12.023.

BACKGROUND: Statistical methods and adverse events (that is, harms) data affect the accuracy of conclusions about the risk-to-benefit ratio of treatments for temporomandibular disorders (TMDs). The authors reviewed the quality of reporting in TMD clinical trials to highlight practices that are in need of improvement. TYPES OF STUDIES REVIEWED: The authors included articles published between 1969 and May 31, 2013, in which the investigators reported randomized clinical trials of TMD treatments with pain as a principal outcome variable. Investigators in trials of nonpharmacologic and noninvasive treatments were required to at least mask the participants and assessors; all others were required to be double masked. RESULTS: Ninety articles qualified for this review: 39 published between 1971 and 2005 (older articles) and 51 published between 2006 and 2013 (newer articles). Specification of primary outcome analyses, methods to accommodate missing data, and adverse event collection methods and rates were generally poor. In some cases, there was apparent improvement from the older to the newer cohort; however, reporting of these methodological details remained inadequate even in the newer articles. PRACTICAL IMPLICATIONS: This review is designed to alert authors, reviewers, editors, and readers of TMD clinical trials to these issues and improve reporting quality in the future.

[Methodological quality of a systematic review on physical therapy for temporomandibular disorders: influence of hand search and quality scales.](#)

Craane B, Dijkstra PU, Stappaerts K, De Laat A.
Clin Oral Investig. 2012 Feb;16(1):295-303. doi: 10.1007/s00784-010-0490-y.

The validity of a systematic review depends on completeness of identifying randomised clinical trials (RCTs) and the quality of the included RCTs. The aim of this study was to analyse the effects of hand search on the number of identified RCTs and of four quality lists on the outcome of quality assessment of RCTs evaluating the effect of physical therapy on temporomandibular disorders. In addition, we investigated the association between publication year and the methodological quality of these RCTs. Cochrane, Medline and Embase databases were searched electronically. The references of the included studies were checked for additional trials. Studies not electronically identified were labelled as "obtained by means of hand search". The included RCTs (69) concerning physical therapy for temporomandibular disorders were assessed using four different quality lists: the Delphi list, the Jadad list, the Megens & Harris list and the Risk of Bias list. The association between the quality scores and the year of publication were calculated. After electronic database search, hand search resulted in an additional 17 RCTs (25%). The mean quality score of the RCTs, expressed as a percentage of the maximum score, was low to moderate and varied from 35.1% for the Delphi list to 54.3% for the Risk of Bias list. The agreement among the four quality assessment lists, calculated by the Interclass Correlation Coefficient, was 0.603 (95% CI, 0.389; 0.749). The Delphi list scored significantly lower than the other lists. The Risk of Bias list scored significantly higher than the Jadad list. A moderate association was found between year of publication and scores on the Delphi list ($r = 0.50$), the Jadad list ($r = 0.33$) and the Megens & Harris list ($r = 0.43$).

[Critical appraisal of methods used in randomized controlled trials of treatments for temporomandibular disorders.](#)

Fricton JR, Ouyang W, Nixdorf DR, Schiffman EL, Velly AM, Look JO.
J Orofac Pain. 2010 Spring;24(2):139-51.

AIMS: To evaluate the quality of methods used in randomized controlled trials (RCTs) of treatments for management of pain and dysfunction associated with temporomandibular muscle and joint disorders (TMJD) and to discuss the implications for future RCTs. METHODS: A systematic review was made of RCTs that were implemented from 1966 through March 2006, to evaluate six types of treatments for TMJD: orthopedic appliances, occlusal therapy, physical medicine modalities, pharmacologic therapy, cognitive-behavioral and psychological therapy, and temporomandibular joint surgery. A quality assessment of 210 published RCTs assessing the internal and external validity of these RCTs was conducted using the Consolidated Standards of Reporting Trials (CONSORT) criteria adapted to the methods of the studies. RESULTS: Independent

assessments by raters demonstrated consistency with a mean intraclass correlation coefficient of 0.63 (95% confidence interval). The mean percent of criteria met was 58%, with only 10% of the RCTs meeting the four most important criteria. CONCLUSIONS: Much of the evidence base for TMJD treatments may be susceptible to systematic bias and most past studies should be interpreted with caution. However, a scatter plot of RCT quality versus year of publication shows improvement in RCT quality over time, suggesting that future studies may continue to improve methods that minimize bias.