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Surgery Versus Conservative Management Of TMJ Disc Displacement Without Reduction: A Systematic Review

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Abstract:
Various therapies have been utilized to treat individuals with disc displacement without reduction (DDwoR) in the temporomandibular joint (TMJ), but their clinical effectiveness is unknown.
Methods: *Up until November 1, 2020, four databases — CENTRAL, PUBMED (MEDLINE), EMBASE, and Scopus – were electronically searched. Other manual sources included citation searches and reference lists of included research, reference lists of pertinent review papers and textbook chapters, and 7 journals with a high likelihood of including papers related to the review topic. The researchers looked at two key outcomes (TMJ pain intensity and maximum mouth opening) as well as a number of secondary outcomes.*
Results: *According to the present systematic review of literature, there is little support for strengthening activities that target the masticatory muscles. There was also no evidence for manual soft tissue work targeting masticatory muscles, which could be due to the pterygoid muscles' limited accessibility to palpation. Splint therapy and electrophysical modalities, such as laser therapy, ultrasound, TENs, and iontophoresis, had little to no evidence for pain alleviation.*
Conclusion: *The included studies were too heterogeneous and at an unclear to high risk of bias, hence evidence levels are now insufficient for conclusive judgments. Because of the similar treatment outcomes, the scarcity of high-quality evidence, and the higher risks and costs associated with more complex treatment, patients should be encouraged to try them.*

Keywords: *Disc displacement without reduction (DDwoR), temporomandibular disease (TMD), temporomandibular joint (TMJ),*

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I. Introduction

Disc displacement without reduction (DDwoR) of the temporomandibular joint (TMJ) is a type of temporomandibular disease (TMD) that causes TMJ pain and limited mouth opening (painful locking), sometimes known as a "closed lock" (Okeson, 2007)[1]. DDwoR can be acute or chronic, depending on how long the lock has been locked (Sembronio et al., 2008; Saitoa et al., 2010)[2,3]. Its prevalence in TMD patients is believed to be between 2% and 8% (Manfredini et al., 2011; Poveda-

Roda et al., 2012)[4,5].Various therapies for DDwoR have been proposed, however the most efficacious/effective strategy is yet unknown, which may lead to management based on experience rather than evidence (Durham et al., 2007)[6].

As a result, the goal of this systematic review was to look into the impact of various conservative and surgical procedures utilized in the treatment of TMJ DDwoR.

II. Methodology

Criteria for Considering Studies

Inclusion criteria:

1. *PubMed (MEDLINE), Cochrane Library and Science Direct databases were included to search the articles related to keywords.*
2. *Participants: Any age and gender who have been diagnosed with acute or chronic DDwoR clinically and/or radiologically.*
3. *Studies related to minimally invasive/conservative treatment of TMDs.*
4. *Studies on surgical approach of TMDs treatment.*
5. *Studies discussing etiology/ pathogenesis of TMJ disorders.*
6. *Case reports, overviews, systematic reviews related to 2,3,4 were included*
7. *Abstracts and full text articles both were included*
8. *Alternative interventions, placebos, or no treatment are all examples of comparators/controls.*
9. *Clinical trials, both randomized and quasi-randomized (RCTs and q-RCTs).*

Exclusion Criteria:

1. *Not documented in English language.*
2. *Studies earlier than 2000*
3. *Studies unlocked by payment modes*
4. *Studies irrelevant to e-search criteria*
5. *Duplicated documents*

• The following are the outcomes:

TMJ pain severity and unassisted/active maximum mouth opening were the primary objectives (MMO). Other mandibular movements, mandibular function or patient quality of life, therapy cost, operation/admission length in surgical trials, and adverse events are secondary outcomes in surgical trials.

Searching Techniques

Up until November 1, 2020, four databases — CENTRAL, PUBMED (MEDLINE), EMBASE, and Scopus – were electronically searched. Other manual sources included citation searches and reference lists of included research, reference lists of pertinent review papers and textbook chapters, and 7 journals with a high likelihood of including papers related to the review topic.

Collection and analysis of data Selection of Research

The inclusion/exclusion criteria were used to determine which research were eligible. The first reviewer identified irrelevant papers by their title/abstract and eliminated them.

The studies that were not included at this stage were identified, and the reasons for their absence were recorded.

Extraction and management of data

The first reviewer extracted and documented data from eligible studies (SA). The correctness of all data extracted was double-checked by the second reviewer (Dr X), who was blinded to the authors' names, institutions, and journal. The authors of the studies that were included in the review were contacted to clarify research design and/or obtain missing data, as needed.

Interventional Effects

The invasiveness of the procedures examined varied greatly. The interventions were divided into three modalities for the purposes of this review, based on their level of invasiveness:

Non-invasive (conservative) treatment options include education, self-management, splint therapy, physiotherapy, and their combinations; minimally invasive treatment options include arthrocentesis; and invasive (surgical) treatment options include arthroscopic and open joint procedures.

Self-management

Over the short term, two trials (Minakuchi et al., 2001; Yuasa and Kurita, 2001)[7,8] compared self-management (self-exercises + self-care/medication) against no active treatment. Minakuchi et al. (2001)[7] found no statistically significant differences in all examined outcomes between self-management and schooling .

In Yuasa and Kurita (2001)[8], a higher percentage of patients in the self-management group reported less discomfort and more openness, although the difference was not significant.

Splint

This comparison was done by Lundh et al. (1992)[9] on patients who were diagnosed by arthrography and given information and pain medication as needed. Over time, the number of patients with reduced pain was considerably higher in those who were not treated than in those who were treated with splints. Self-management, on the other hand, showed a statistically significant difference in impact over splints for MMO.

Splints vs. Self-management

Haketa et al. (2010)[10] contrasted self-management that included self-exercises (+) to self-management that did not (NSAIDs/self-care) with splint (+ NSAIDs/self-care).

In the short term, the self-management group had a higher reduction in pain intensity, but the difference was not statistically significant.

Self-management, on the other hand, showed a statistically significant benefit in MMO. In comparison to a splint, there is a significant difference in effect .

Transcutaneous Electric Nerve Stimulation vs. Splint

The number of patients who experienced a 50% reduction in pain was significantly higher in the splint group than in the transcutaneous electric nerve stimulation (TENS) group in Linde et al. (1995)[11], but there was no statistically significant difference between the interventions on MMO in the short term. TENS generated a brief hypersensitive reaction on the pre-auricular skin.

Education vs. Jaw Exercises

Craane et al. (2012)[12] compared physiotherapist-assisted jaw manipulation to DDwoR education with and without limited openness. Above the short and long term, jaw exercises had no additional effect over education alone on all examined outcomes.

Education vs. Combination Therapy

Minakuchi et al. (2001)[13] compared the short-term effects of a combination splint plus exercises (+ self-care/medication/education) to education alone, finding no statistically significant differences in effect on any evaluated outcomes.

Self-management vs. Combination Therapy

Two studies compared the effects of different combinations.

Exercises and a splint are part of the rehabilitation (more self-care, medicine, and education)

CBT (cognitive behavioral therapy) is a type of therapy that combines cognitive behavioral therapy (CBT) self-care/medication/self-management (Minakuchi et al.)[13] education self-exercises to name a few. There were no statistically significant differences found between the treatment outcomes on all outcomes that have been measured over time longest follow-up . When the data was combined, it revealed

there were no statistically significant differences found between the short-term and long-term consequences of treatments to reduce pain intensity.

Using a Splint with Jaw Exercises vs. Using a Splint Only

Patients with "disc displacement" or osteoarthritis were compared in two studies, with the main difference being how jaw exercises were delivered: by clinicians (Ismail et al., 2007)[14] or by patients using either a mechanical device (Therabite) or wooden tongue depressors (WTDs).

PEMF (Pulsed Electromagnetic Fields): Active vs. Placebo

Peroz et al. (2004)[15] found that active PEMF had no additional benefit above placebo on all evaluated outcomes in DDwoR patients in the short or medium term .

Iontophoresis (Active) vs. Iontophoresis (Placebo)

Schiffman et al. (1996)[16] found that active iontophoresis with dexamethasone + lidocaine had better short-term benefits on all outcomes than placebo iontophoresis with normal saline, although the differences were not statistically significant .

Skin erythema and dizziness were two moderate temporary side effects caused by iontophoresis.

III. Discussion

Physical therapy is the preferred conservative technique for treating TMD, according to Shaffer et al. (Shaffer et al., 2014)[17], since it allows for multi-modal treatment that targets patient-specific deficits. Treatment of anatomical features that are congruent with the underlying illness is required for successful management.

Role of Exercise in Temporomandibular Dysfunction (TMD)

Given the reciprocal actions of the superior and inferior heads of the lateral pterygoid it's possible that decreased superior head agonist activity leads to increased inferior head antagonist activity, a theory consistent with pain adaptation. Similarly, the Vicious Cycle Model predicts that decreased superior head activity will lead to overuse of the inferior head, resulting in an energy deficit and setting the stage for muscular hypertonicity.

Notably, both models result in hyperactive masticatory muscles, which is exacerbated by psychological factors. Perhaps this explains the paucity of evidence for masticatory muscle training as a treatment for TMD. That is, purposeful activation of already hyperactive muscles may not be beneficial and does not appear to be well supported by the literature. Given the lack of inter-examiner

reliability in locating trigger points in the upper trapezius, a fully accessible muscle, it appears highly unlikely that clinicians can reliably locate trigger points in the lateral pterygoid and needle them consistently. The lateral pterygoid's inaccessibility to palpation could possibly account for the lack of evidence poor the treatment of TMD with soft tissue mobilization.

Manual soft tissue treatments targeting those muscles may not be beneficial for more than symptom relief. That is, manual soft tissue techniques may improve symptoms associated with TMD by affecting more accessible muscles such as the temporalis and masseter, but they are unlikely to reach the pterygoid muscles, which are not only more intimately related to the joint itself, but also more likely one of the primary etiologic factors in TMD.

Role of Electrophysical Modalities in Temporomandibular Dysfunction

McNeely et al. (2006)[18] found no evidence to support the use of any electrophysical modalities routinely used by physical therapists to relieve pain associated with TMD, including pulsed radio frequency energy, biofeedback, laser therapy, and TENS (McNeely et al., 2006)[18]. Since the ultrasound penetration half depth into a 2003) and laser intensity is lowered by 90% at a tissue depth of 1cm, very little of the sound waves or energy likely reaches the TMJ or pterygoids.

A number of systematic reviews, for example, have shown little to no evidence to support the use of ultrasonography for musculoskeletal problems. (Shaffer et al., 2014)[17] in general, including TMD. Furthermore, whereas the depth of penetration of TENs is dependent on the size and distance between surface electrodes.

Splint Therapy for Temporomandibular Dysfunction

Al-Ani et al. found inadequate evidence to support the use of splint therapy for the treatment of TMD in a 2004 Cochrane review (Al-Ani et al., 2004)[18]. Niemela found that splint treatment, counseling, and masticatory muscle exercises were no more effective than counseling and masticatory muscle exercises alone after treating 80 TMD patients.

Joint Mobilization in Temporomandibular Dysfunction

Non-thrust joint mobilization improves the extensibility of noncontractile tissue and increases range of motion while reducing pain and impairment via peripheral, spinal, and supraspinal mechanisms. However, there are currently just a few studies that have looked into the use of mobilization for TMD in addition to other conservative treatments such self-exercise, cognitive therapy, self-management education, and manipulation .

Joint Manipulation in Temporomandibular Dysfunction

At the level of the spinal cord, high-velocity low-amplitude (HVLA) thrust manipulation has been found to enhance afferent discharge rates of mechanoreceptors to quiet alpha motor neuron pool activity and, as a result, lower muscle activation levels.

Needling Techniques for Temporomandibular Dysfunction

While Western-based DN and traditional Chinese acupuncture have different language, philosophy, and theoretical constructions, the process for inserting monofilament needles is the same. As a result, throughout this section, manual and electric DN are used interchangeably with manual and electroacupuncture to describe needling treatments that penetrate the skin without the use of medicine or injectate. Despite the fact that acupuncture allows for direct contact with the TMJ joint capsule and the superior and inferior heads of the lateral pterygoid muscle, many of the controlled trials that have attempted to treat TMD with acupuncture have found limited results (McNeely et al.,

2006).[18] In a comprehensive study by List and Axelson, acupuncture was found to be no more effective than occlusal appliances, behavioral therapy, exercise, posture training, and pharmacological medications in treating TMD.

While no studies have directly investigated the use of dry needling or acupuncture to improve the health of intra- and peri-articular aspects of the TMJ in patients with TMD, there is evidence that acupuncture may be beneficial for joint osteoarthritis (OA), primarily due to its ability to stimulate vasodilation and facilitate neovascularization. Improved blood flow to joints as a result of acupuncture has been demonstrated to increase the recruitment of opioid-producing immune cells needed to lower inflammatory cytokine levels. [17-19]

IV. Comparisons:

Arthroscopy vs. Conservative Treatments

Schiffman et al. (2007)[16] compared arthroscopic surgery with 2 conservative treatment strategies: self-management (self-care/medication/ education) and combination of splint
plus exercises (+ self-care/medication/ education + CBT). Arthroscopy did not demonstrate statistically significant differences in effect over conservative interventions on all measured outcomes over the short or long term.

Arthrocentesis vs. Combination Therapy

In patients with 'acute' DDwoR (less than 4 weeks), Diracoglu et al. (2009)[20] compared arthrocentesis to a combination of splint + self-care/self-exercises and concluded that arthrocentesis outperformed the combined treatment on pain in both the short and long term, but there was no statistically significant difference between the therapies on MMO.

Arthrocentesis vs. Arthroscopy

Two trials compared disc displacement with and without decrease in individuals with disc displacement. According to Goudot et al. (2000)[21], there was no statistically significant difference in the long-term impact of the therapies on pain. In the case of MMO, pooling the data revealed a statistically significant difference favoring arthroscopy over time. Goudot[21]et al. (2000) identified four surgical complications: Two intra-operative problems (2 severe reversible bradycardias) in the arthrocentesis group, and two post-operative problems (transient frontal palsy and prolonged cervico-facial edema) in the arthroscopic group.

Open Surgery vs. Arthroscopy: Three investigations compared the impact of the two procedures on all evaluated outcomes during the longest follow-up period and found no statistically significant differences [16]. However, when the study lacking confirmatory diagnostic imaging was excluded, sensitivity analysis revealed no statistically significant difference in the surgical techniques. Furthermore, combining data from two investigations (Holmlund et al., 2001)[22] revealed no statistically significant differences.

V. Conclusion

In patients with TMD, there is insufficient evidence to promote soft tissue release and mastication muscle strengthening exercises. There is little to no evidence to support the use of electrophysical modalities and splint treatment for the relief of pain associated with TMD. The most evidence-based approach for conservatively treating TMD may include non-thrust joint mobilization and HVLA thrust manipulation of the TMJ and/or upper cervical articulations, as well as dry needling or acupuncture of the lateral pterygoid muscle and posterior peri-articular connective tissue.

Research Implications

There is only a smattering of evidence to back this claim, the adoption of basic, minimal, non-invasive conservative therapies as a first line of defense,

Patient education, self-management, and early mandibular development are all important. For DDwoR, manipulation. Future research needs to examine these interventions specifically to provide more robust evidence of their efficacy or lack of it. The evidence for the effectiveness of minimally invasive surgical intervention through arthrocentesis and lavage is contradictory. Given its less invasive nature, future high-quality pragmatic RCTs are required to compare the effects of arthrocentesis with those of conservative interventions.

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