



REVIEW ARTICLE

Temporomandibular Joint Disc Displacement with Reduction: A Narrative Review

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Abstract

Disc displacement with reduction is one of the most common intra-articular disorders of the temporomandibular joint, it is characterized by the progressive displacement of the articular disc against the mandibular condyle and the articular eminence, accompanied by clicking sounds or crepitus, pain, and in some cases presents a limitation of mandibular movement. Some treatment proposals include physical therapy and occlusal splints; if it is not treated in some cases it can become disc displacement without reduction. This review aims to generate recommendations based on the scientific evidence available for the diagnosis, treatment plan, and pertinent follow-up of patients affected with reduced disc displacement.

Keywords

Temporomandibular joint, Temporomandibular joint disc, Temporomandibular disorders, Temporomandibular joint pathology

Abbreviations

TMD: Temporomandibular Disorders; TMJ: Temporomandibular Joint; DDWR: Disc Displacement with Reduction; DD: Disc Displacement

Introduction

Temporomandibular disorders (TMD) are a series of heterogeneous conditions that affect the dental and orofacial structures, differentiated by the extent of the muscle and/or joint damage that they may cause. Symptoms and signs may include painful joint sounds, restricted or deviated ranges of motion, and cranial and/or muscle pain [1]. TMDs may affect approximately 20

to 40% of the general population, with most patients falling between the 18 to 45 years and symptoms occur disproportionately between the genders, with a much higher incidence in women [2,3].

Among the conditions of clinical interest are intra-articular disorders of the temporomandibular joint (TMJ), which are quite frequent, especially disc displacement with reduction (DDWR), which is reported among the 12 most common TMDs and is characterized by the progressive displacement of the articular disc against the mandibular condyle and the articular eminence, accompanied by clicking sounds in the TMJ, crepitation and, in some cases, pain and limitation of movement of the jaw [4,5]. At least 47.4% of the Colombian population has suffered from TMD, therefore it is necessary to study its development in greater depth to intervene appropriately and for the benefit of patients.

There is a growing need to minimize the gap between research and clinical practice, thus optimizing the information available to both professionals and patients. Therefore, the aim of this review is necessary to consider the best available scientific evidence and transform it into recommendations about the management of temporomandibular joint disc displacement with reduction.

Preventive Strategies for DDWR

Most of the literature to date has related gender, anatomical, or clinical findings and imaging characteristics to disc displacement (DD) findings in young patients. Although the prevalence of TMD is higher in older adults,

its presence among young patients should not be neglected. The retrospective cohort study by De Melo, et al. suggests that DDWR occurs frequently in pre-orthodontic adolescents and regardless of age group, women are highly predisposed. Young patients are susceptible to all stages of DD and report a statistically significant lack of association between bone abnormalities, pain, and DD, except for the most severe stage of DD, which was strongly correlated with both variables [6].

On the other hand, Bruguiera, et al. established the lack of statistically significant differences in the distribution of the DDWR according to gender in patients under 21 years of age. There is a significant association between the presence of any dysfunctional oral habit with DDWR, which means that patients with at least one dysfunctional habit before orthodontic treatment had a 4.6 times probability of developing a DDWR one year after surgery [7]. Therefore, treating such habits before orthognathic surgery should help prevent adverse health outcomes from TMJ. Bruxism, of all the parafunctional habits studied, was the only one to show an association with TMD before and after orthognathic surgery. It can be seen how some studies suggest that orthodontic treatment may play a causal role in the development of DD while others state that orthodontic treatment cannot be a risk factor for the development of TMD signs and symptoms, although this it is not specific to DD. Ahn, et al. report as skeletal characteristics of patients with DD, a backward rotation of the mandible, a short ramus height, a decrease in length, and mandibular asymmetry. In the study carried out, there were no statistically significant differences in skeletal changes between patients in the control group and those with DDWR treated with orthodontics, however, they showed greater backward movement and rotation of the jaw during orthodontic treatment [8].

Therefore, preventing the development of TMD has been a debatable and controversial issue, which mainly encompasses the etiology due to the lack of scientifically validated evidence of the causes. Although occlusion has been recognized as an important etiologic or perpetuating cofactor, the degree to which it plays a role has not been definitively delineated. According to Chiappe, et al. occlusal characteristics report a low predictive value for detecting DDWR. In a previous review carried out, they reveal few and weak associations between the functional malocclusion factors and TMD, while the final results report only a poor association between three occlusal characteristics (retruded contact position/maximum intercuspation with sliding less than 2 mm, mediotrusive interferences, absence of canine guidance in lateral movements) and a DDWR [9].

Risk Factors for DDWR

Jung, et al. shows in their results that the severity of DD from a normal position to a bilateral DD increased as

the sagittal skeletal classification changed from skeletal Class III to Class II and the vertical skeletal classification changed from hypodivergent deformities to hyperdivergent, regardless of sex. Furthermore, 88.1% of the patients with skeletal class II had DD on at least one side of the TMJ, indicating that the severity of the displacement is associated with sagittal and vertical skeletal deformities [10]. Adult patients may have TMJ signs and symptoms unexpectedly because of the ability to adapt and heal gradually decreases with aging. On the other hand, Millon-Cruz, et al. reports a direct relationship between the degree of joint degeneration and the appearance of adhesions. Concerning clinical symptoms, there is a higher incidence of adhesions in patients with limited mouth opening for a longer time and in older patients, finding a significant relationship between the presence of adhesions and DDWR. The reason could be that disc hypomobility may be a factor in the genesis of adhesions; however, it is not possible to reach that conclusion according to this study [11].

Regarding bruxism, Wieckiewicz, et al. report in their results the DDWR as the second most common TMD evaluated in bruxism patients (study frequency 42.86%) compared with a control group (frequency 23.81%). Given that TMDs are complex and multifactorial in origin, it has also been necessary to verify whether the specific diagnoses are associated with the appearance of bruxism. This study indicates that sleep bruxism does not increase the risk of any specific diagnosis of DD. The distribution of TMD between sleep bruxers and non-bruxers is similar; therefore, the prevalence of sleep bruxism does not seem to be a certain risk factor for TMD onset [12].

Diagnosis of DDWR

Pullinger, et al. show that the computed tomographic of the TMJ can usefully differentiate the sub-diagnoses of DD disorders when the TMJ is properly examined as a multifactorial system in which the position of the condyle interacts with the shape and proportions of the fossa. Compared with healthy asymptomatic TMJs, the DDWR indicates a tendency for wider and/or shallower fossae with a greater length of the slope of the articular eminence. While the Disc displacement without reduction indicates a trend towards a flatter eminence slope curvature. However, no statistically significant differences were found from normal TMJs for the width-depth ratio of the fossa in the tomograms performed. These results suggest certain closeness between these disorders that are presumably associated with disc instability [13].

Regarding the clinical assessment, Masumi, et al. determines if measurements of mandibular movement could be used to distinguish between the most common TMD subgroups. The results show that the osteoarthritis group was different from both the arthralgia group

and the DDWR group alone and the maximum pain-free opening was significantly different from the maximum active opening and maximum passive opening measurements. However, when individual aperture measurements were compared within subgroups, there were no significant differences between subgroups for aperture measurements. The widest opening of the jaw occurred in the DDWR subgroup, suggesting that these patients may tend to mild hypermobility. For measurements of lateral/protrusive mandibular movement results, there were no significant differences for the between subgroups. The authors necessitated the need for a clinical examination method to define subgroups of patients with TMD, which implies a constant palpation technique to avoid inconsistencies in the examination and diagnosis process. The 2 selected sites (superficial masseter and anterior temporal) have consistently been shown to be the most reproducible sites when repeated examinations are performed on the same patient [14].

Magnetic resonance imaging is the gold standard of imaging criteria for visualization of the TMJ region and is currently considered the optimal modality for a comprehensive evaluation in patients with TMD [15]. However, sound recordings can be used to assess the status of internal TMJ disorders [16]. The evaluation consists of correlating the sound of the mouth opening and closing; protrusion and lateral movements of the jaw, and analyze whether the sound of the TMJ in the jaw excursions is indicative for the diagnosis and establishment of the severity of internal TMJ disorders; as a conclusion, the clicking sounds suggest a DDWR, and the crepitus suggests a progression from disc displacement without reduction, to degenerative arthritis.

Management of DDWR

In a 90-patient clinical trial that evaluated the efficacy of supervised exercise, home therapy, and occlusal splint therapy over three months; after supervised exercises and occlusal splints, they were found to have a moderate effect in reducing the severity of joint noise by 30% [17].

The use of occlusal splints is considered a passive intervention in order to improve parafunctional activity and reduce the biomechanical load on the joint. Splints are believed to stabilize static and dynamic physiological occlusion, relax the masticatory musculature, and balance stress relationships caused by physiological factors on joint structures. There are different types of occlusal splints: for anterior repositioning, pivoting splints, stabilizing splints, among others. All indicated for the treatment of joint noises and pain. Fayed M, et al. evaluated the anterior repositioning plate and the canine plate for the relief of signs and symptoms of DDWR. They concluded that both splints are effective in eliminating joint pain and noise, however, the canine splint proved to be superior by allowing decompression of the

articular disc, recovering its length and shape [18]. The use of nighttime anterior repositioning splints and stabilizing splints in combination with behavioral therapy has been shown to improve maximum mouth opening and subjective and objective symptoms [19]. Tecco, et al. evaluated fixed orthodontic treatment versus occlusal splint treatment, with a 6-month follow-up. They reported that patients with orthodontics and an occlusal splint had a significant decrease in joint and muscle pain. Orthodontic patients reported a significantly lower level of discomfort than patients wearing splints. Besides, the fixed appliance resulted in greater patient comfort during the first three months of treatment, and an accelerated resolution of the malocclusion [20].

Some authors suggest the implementation of combined conservative and invasive treatments when conservative therapies have not obtained the expected and adequate results. One option is the use of anterior repositioning occlusal splints and the biostimulation laser. The anterior repositioning plate assists in the elimination of opening noise, however, the splint design should be considered for a positive result. The intervention with laser biostimulation in 12 sessions every two days in both TMJs combined with exercises of the masticatory muscles is a standard and valid procedure for the relief of pain from joint disorders. In addition, when performed with exercises, it provides long-term biomechanical stability [21].

Other less invasive techniques reported in the literature are arthralgia, arthrocentesis, hyaluronic acid injections, and currently the use of an injection of platelet-rich plasma. Platelet-rich plasma is beneficial for its healing properties through cell proliferation and differentiation, and tissue remodeling. Its inflammatory modulation capacity eliminates pain inducers and provides repair of the disc, the capsule, and the retrodiscal area; it also contains growth factors, which could increase the proliferation of chondrocytes in cartilage. Platelet-rich plasma application is more effective than arthrocentesis since arthrocentesis can only remove inflammatory cells and increase interstitial distance by removing adhesions. Although injection of platelet-rich plasma is a highly recommended therapeutic approach, more long-term studies are needed to explain the regenerative properties, molecular effect, and activating potency of stem cells [22].

Hyaluronic acid has shown anti-inflammatory effects such as inhibition of phagocytosis, chemotaxis, prostaglandin synthesis, metalloproteinase activity, and removal of oxygen radicals from synovial tissue. The application of hyaluronic acid and the use of an occlusal splint have also been shown to reduce noise and joint pain, allowing an increase in mouth opening in repeated injections of hyaluronic acid immediately after arthrocentesis, without complications or effects secondary after the procedure [23].

Different treatment protocols have been used to inject hyaluronic acid, including in-session injections with or without arthrocentesis, a second injection 7 or 15 days after the first injection, three injections 3 weeks apart, and a cycle of five injections weekly with or without arthrocentesis. However, there is no established protocol for the application of hyaluronic acid injection.

Arthrocentesis has been shown to work by allowing a significant increase in maximum occlusal vertical opening immediately after treatment. An 88% success rate has been reported for use in disc displacement cases, and individual success rates were 91% for the DDWR, and 75% of the DD without reduction [24].

A systematic review evaluated the application of hyaluronic acid and viscosupplementation with the respective polysaccharide in the clinical treatment of temporomandibular dysfunctions. In 21 articles different protocols were found for the application of hyaluronic acid. The results show that the possible application of this substance only seems to be effective in reducing pain compared to placebo groups or other therapies. The combination of arthrocentesis with hyaluronic acid does not appear to be superior to using the procedure regardless of the number of sessions. The standardization of therapeutic protocols with hyaluronic acid is recommended since in the treatment of TMD it must be solid and with more uniform follow-up periods [25].

The use of occlusal splints should be subjected to permanent control and supplemented with exercises; In this way, it is possible to reduce the presence of noise in the long term and an important relief for the symptoms of pain in the TMJ [17].

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