

Disc Displacement with Reduction of the Temporomandibular Joint: The Real Need for Treatment

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Abstract

Disc displacement with reduction is a condition that remains very controversial regarding its diagnosis and the application of a specific treatment, because its clinical characteristics, most often, presents no symptoms requiring treatment, as well as the imaging tests do not correlate with the clinical condition. For this reason it was carried out a literature review of the most current studies in order to introduce readers to concepts that are currently in place about this issue. Data bases were searched from 2000 to 2015 using the following terms: temporomandibular articular disk; temporomandibular disorder and sound. The eligibility criteria included: articles peer reviewed in english and portuguese about etiological factors, characteristics, diagnostic methods and types of treatments. With this work we concluded that the condition of disc displacement with reduction may not be perceived by patients as relevant in terms of jaw pain, function and disability because, usually evolve with self-resolution and may pass through a symptomatic to an asymptomatic picture without applying any treatment. However, if this condition is present and characterize the patient's main complaint, it should be followed up and treated initially with conservative measures going to minimally invasive techniques if necessary.

Keywords: Disc displacement; Temporomandibular joint

Introduction

Temporomandibular joint (TMJ) is considered to be the most complex synovial articulation in the human body. Articular surfaces within this joint are in contact with the articular disc, a nonvascular structure and nourished by synovial fluid, a secretion of the internal layer of the articular capsule, the synovial membrane. In sagittal view, the articular disc is a flexible and biconcave structure, constituted by dense connective tissue, usually positioned between the posterior slope of the articular tubercle and the anterior medial surface of the mandibular condyle. It transversally splits the TMJ in two distinct compartments, which are completely separate under normal conditions. It is possible to identify three different regions in the articular disc: the posterior band (the thickest portion), the intermediate (central) band (the thinnest part) and the anterior band (with intermediate thickness).

At a magnetic resonance imaging (MRI) analysis obtained with parasagittal projections, the position of the disc within the TMJ is considered normal whenever the posterior band is seen at "12 o'clock position" in which the posterior band of the disc is located over the cranial portion of the mandibular condyle, with elevated mandible (that is, closed mouth and dental contact) [1-4]. Nevertheless, many studies reveal that such "12 o'clock position" of the disc is not observed in approximately 30% of asymptomatic subjects [3-5]. Thus, this condition raise a question about the normal position of the disc definition. The articular surface of the mandibular condyle is related to the intermediate band of the disc, where the compression forces applied are higher [6]. This position is maintained by an intra-articular pressure that precludes the separation of the articular surfaces, and may vary according to the activity of the mandible elevator muscles [6,7].

The TMJ may be involved in any systemic illness that affects other joints; however, the observed local alteration is considered an internal derangement. Internal derangements of the TMJ are defined as any alteration in shape or position of its constitutive tissues [6,8-10], for instance: degenerative articular conditions (osteoarthritis), inflammatory arthritis and synovitis, articular disc alterations: adhesions, adhesion, displacement and dislocation [11].

TMJ disc displacement is a disorder characterized by the abnormal position of the articular disc in relation to the mandibular condyle

and the mandibular fossa [6,11-13]. There are eight abnormal disc positions; however, the anterior and the anterior-lateral displacements are the most common ones [14]. When it occurs, the bilaminar zone is pressed against the articular surfaces, gradually replacing the function of the disc itself. Such condition induces modifications in the mechanical properties, and diminishment of the vascular and nerve supply to this tissue [3,6]. Posterior disc displacements are quite rare. In TMJ disc displacement maximal compression forces are located at the posterior band of the disc, that tends to flatten and stretch [3,13]. Disc displacements may be partial or complete, depending on its extension [3,9,14,15]. Superior shifts particularly occur when the posterior band of the disc is anterior to the so called "12 o'clock position" [8]. Disc displacements may be classified as follows: disc displacement with reduction (DDWR) and disc displacement without reduction (DDWoR) [1]. This study includes only DDWR cases, in which the shift is observed during mandible elevation (mouth closure) and a repositioning of the disc to a normal relation with the mandibular fossa of the temporal bone and the mandibular condyle occurs during the lowering movement of the mandible (mouth opening). In DDWR, the sigmoid shape of the articular tubercle and the biconcave shape of the disc are the most frequently observed [16]. Some authors state that DDWR would be the first stage of disc displacement, possibly evolving to DDWoR [9,17,18]. Nevertheless, such observation is not consistent to all conditions and types of DDWR that actually evolve to DDWoR [19,20]. DDWR are considered stable as long as there are no complaints regarding intermittent locking in patient's history [21].

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Etiological factors

Etiological factors to DDWR are partially attributed to abnormal biomechanical forces applied to the mandibular condyle, which alter the shape and function of the articular tissues, generally causing articular noise during mouth opening and closure movements [2,3,9,11,12,22]. Bruxism, stress, dental clenching, para-functions, mandible trauma, excessive mastication, shape alterations of the articular tubercle and articular surfaces, lack of lubrication, disc modifications, degenerative articular disorder, hyperactivity of the lateral pterygoid muscle, ligament sprains, abnormal dental occlusion, mandible hypoplasia, loss of posterior teeth, deflective dental occlusion, hypermobility and, occasionally, whiplash injury, are also considered as possible risk factors for DDWR [4,5,18,23-25].

Diagnosis and characteristics

The main characteristics of DDWR are the joint clicking. Nevertheless, such symptom should not be considered as a pathognomonic factor to DDWR, since it may result from other conditions, such as hypermobility, shape alterations, disc adhesions, imprisonments or perforations, and even a chronic DDWR [26]. Etiological factors that lead to joint clicking are still unclear. Some authors suggest that TMJ clicking may initiate during childhood or adolescence [27]. However, the high prevalence and presence of TMJ clicking indicate that they may be considered physiologically normal, that is, without any sign of alteration. Epidemiological studies report that TMJ noises, clicking in particular, occur in up to 60% of the general population [28]. Therefore, the presence of clicking alone cannot be considered a sign of DDWR [7], because it can also be due to lateral pole hypertrophy, synovial chondromatosis, loose bodies, irregularities, disc deformity among others [29]. TMJ clicking is a typical temporomandibular disorder symptom with uncertain evolution [20].

The prevalence of DDWR increases with age [2,12,27]. Between 8 and 15 years old, the prevalence of symptomatic displacement of TMJ disc is about 6%, increasing in the population between 16 and 19 years old, reaching the same prevalence observed in adults [5]. Disc displacement prevalence in adults varies between 75% and 94% [5,27]. The incidence is greater in women, varying from 5:1 to 9:4 [2,30].

Because the prevalence of DDWR increased in the adolescent population, there are some studies that show that mandibular asymmetry is much more common and severe in juvenile unilateral anterior disc displacement patients than in normal population. The more the disc is displaced and deformed, the more the condylar height is shortened and the mandible is deviated [31]. In contrast, others studies suggest that mandibular asymmetry can be considered to constitute etiological or predisposing factors for the development of temporomandibular disorder [32]. The correlation between disc displacement and mandibular asymmetry still unclear, since the findings of one study reveal that very minor asymmetries may exist in otherwise symmetric patients, confirming previous studies that suggest that these discrepancies are normal and may be a reflection of a homeostatic mechanism during growth and bone remodeling [33].

There are some controversies among researchers and clinicians in what concerns the diagnosis, since DDWR is not always associated to pain, presence of TMJ noise [7], or any TMJ dysfunction [34]. It is mandatory to stress out that disc displacements may occur without any symptom or short term TMJ dysfunction [1,6,34,35]. What is currently understood as a change of TMJ structure from normal joint structures to disc displacement to degenerative joint disease may not be perceived by patients as relevant in terms of jaw pain, function, and disability [36].

When DDWR generates pain, the cause may be related to a ligament sprain or over compression of the bilaminar zone of the disc by the mandible condyle. This pain may also be related to a secondary muscle dysfunction, and may limit the movement of mouth opening, which is rather rare in such cases [3]. The type and degree of disc displacement vary among asymptomatic and symptomatic subjects. In asymptomatic subjects, disc displacements are predominantly unilateral, partial and always with reduction. On the other hand, in symptomatic subjects, it is usually bilateral, directed to anterior or anterior lateral positions, and reduction is present in 76% of the cases [15]. A common characteristic of the articular disc in cases of disc displacement is a thickening of its posterior band [8,14,37].

Diminishments of articular lubrication may be a common finding in cases of disc displacements, and this suggests the necessity to approach local and systemic aspects that might influence TMJ compression [5,23,24].

Clinical classification criteria in DDWR, validated by the Research Diagnostic Criteria for Temporomandibular Disorder RDC/TMD [38], are:

- Presence of clicking during mouth opening and closure;
- Interincisor distance when the clicking occurs during mouth opening is at least 5mm wider than interincisor distance when the clicking occurs during mouth closure;
- Clicking suppression during mouth opening and closure, with protruded mandible;
- Clicking presence in at least two of three repetitions;
- When clicking occurs only during mouth opening or closure, DDWR is considered whenever when associated to clicking during mandible lateralization or protrusion [11,38].

Reciprocal clicking is defined as presence of one clicking during mouth opening and one during mouth closure [13].

Despite RDC/TMD are the most widely used criteria to diagnose DDWR, many studies have reported some restraints in the employment of such criteria. The reciprocal clicking may not be a reliable characteristic generally applied to DDWR, since it is based on the probability that intra-articular pressure is different during different mandible movements (mouth opening and closure) [26]. Acoustic intensity variations in the DDWR clicking may be related to variations in TMJ compression loads during consecutive movements [39].

Intra-articular pressure is smaller during mouth closure when compared to mouth opening and, therefore, the articular disc may return to its abnormal position without any audible noise [26]. For that reason, clickings during mouth closure may be unnoticed [19]. A way to promote a more uniform intra-articular pressure, facilitating clicking detection, is to mechanically press the TMJ (about 30N), during mouth opening and closure movements, considering the possible etiological factors [28]. The criterion related to clicking repetition in at least two of three movements is not very sensible [26]. Clickings rarely occur during mouth opening and closure with up to 5 mm interincisor distance [40]. Nonetheless, it is not necessary to verify the minimum interincisor distance of 5mm to classify a TMJ disorder as a DDWR, since one study has reported false negative observations to 27% of DDWR cases [19].

To diagnose a posterior DDWR, clickings are not eliminated during mandibular protrusion movement [11] and the patient should report pain during mouth closure in maximum intercuspal contact [22].

Another common clinical finding concerns the deviation of the mandible in the median plane to the side of the affected articulation during mouth opening, and its return to the central position after disc reduction [2,4,9]. Lateral movements restrains to the contralateral side may occur before, but never after the opening clicking, with normal lateral movement to the affected side [2]. If some of this cited signs be present, there is an increased probability to verify a case of DDWR.

Due to so many restrains by using of such criteria for DDWR, since 2014, the International RDC/TMD Consortium Network and the Orofacial Pain Interest Group recommended the employment of the newly Diagnostic Criteria for Temporomandibular Disorder DC/TMD [41], which the clinical classification criteria in DDWR are:

Positive for at least one of the following:

- In the last 30 days, any TMJ noise(s) present with jaw movement or function; OR
- Patient report of any noise present during the exam.

Positive for at least one of the following:

- Clicking, popping, and/or snapping noise during both opening and closing movements, detected with palpation during at least one of three repetitions of jaw opening and closing movements; OR
- Clicking, popping, and/or snapping noise detected with palpation during at least one of three repetitions of opening or closing movement(s); AND
- Clicking, popping, and/or snapping noise detected with palpation during at least one of three repetitions of right or left lateral, or protrusive movement(s) [41].

Whenever the diagnosis is not precisely determinable, an imaging evaluation should be performed to eliminate more severe disorders or systemic conditions.

Computed Tomography (CT) scans may provide relevant information on the anatomy of the bony structures. MRI, on the other hand, suits best to a general evaluation of soft tissues [3]. TMJ MRI provides information on the position and structure of the articular disc, amount of circulating synovia, and anatomical aspects of the bones, posterior ligament, bilaminar zone, bone marrow, periarticular tissues and adhesions [17,42]. MRI is considered to be the gold standard in the diagnosis of DDWR, since is painless, not invasive and the patient is not exposed to radiation [13,43-45]. The employment of ultrasound (US) evaluation is not widely spread, however it should be considered as an alternative to patients who cannot be submitted to regular MRI (patients with history of claustrophobia, cardiac patients using pacemakers, and so forth). In addition, US is also a quick, low-cost and non invasive technique [44,45]. Researches on high resolution US have reported accuracy of up to 90% to detect disc displacement at rest (mouth closed position) and up 92% with lowered mandible (mouth open position), with a sensibility range of 86-92% and specificity of 91-92% [48]. To standardize the US techniques is imperative to promote its employment in the daily clinical practice, since the precision of its result is directly related to the ability and training of the technician in charge [44,45].

Significant discrepancies are often observed between the TMJ anatomical alterations and the related functional disorders [11], which are determined by the frequent incompatibility between MRI data and clinical findings [6,7,46-49]. With that in mind and considering the high costs involved in MRI, clinicians should be cautious whenever

considering the real need to request such kind of evaluation. As a general rule, patient's history and clinical evaluation are the best combination and usually enough to establish a precise diagnosis and to the treatment plan [29].

Treatment

Prior than anything else, in what concerns DDWR treatment, one should observe the needs for therapeutic care, since evidences are that there is a self-resolution tendency to this condition, even without any kind of clinical conduct or treatment [18,42,43].

DDWR may remain stable for years [20], contrary as a continuing progression shown by some studies [4,11,18], depending on adaptive physiological processes that may occur, because in many cases, the sprain of the posterior ligament turns it into a kind of "modified extension" of the posterior band of the articular disc [5]. Thus, in absence of pain or severe dysfunction, and negative response to palpation stimuli, no treatment is recommended [3,20]. Disc displacements treatments may be defined as conservative (or non invasive) or non-conservative (or invasive). Amongst conservative treatments are: cognitive- behavioral therapy, hot and cold therapy, passive and counter-resistance exercises, relaxation techniques, repositioning splints, stabilizing splints, biofeedback, ultrasound, phonophoresis, iontophoresis, transcutaneous electrical neural stimulation, drug therapy, teeth selective grinding, physical auto-regulation [3,4,18,41,44,45].

Invasive treatments comprise TMJ arthroscopies, arthrocentesis and surgical techniques. Despite highly efficient, such means should be only employed after failure of conservative treatments in what concerns persistence of pain and movement restrains [41,43,45-47]. Invasive procedures always involve some risks such as lesions of the facial nerve (frontal branch), lesions of articular structures (disc perforation), local irritation, perforation of the mandibular fossa of the temporal bone, secondary otitis with extravasation of irrigation fluid into the temporal, masseteric and parotid regions, which justify the clinician's caution to recommend any of such procedures as routine or first treatment choice [48,49]. Despite invasive techniques are usually accredited as irreversible and final solutions, recurrences are always possible. The clinical evolution of TMJ degenerative changes and morphological alterations of the mandible condyle due to any disc displacements are reported to be similar for both conservative techniques and arthroscopic treatments [47].

Specific treatments to each kind of disc displacements are not definitely established and many studies have been developed to investigate the efficacy of invasive, non-invasive treatments and different combinations. A recent research has reported an effectiveness range of 70-95% for conservative therapy applied to TMD [4].

Researches on DDWR conservative treatments are scarce, probably due to the self-resolution characteristic of this condition. Cognitive-behavioral therapy, hot or cold therapy, therapeutic exercises and oral appliances are the most common noninvasive treatments [4,9,18,35,42,50].

There is a study that shows the efficacy of arthrocentesis combined with viscosupplements administration [51-59], however no comparisons between this technique and any conservative treatment were conducted as yet.

Conclusion

There are still much controversy in what concerns DDWR diagnosis and treatments. However, some literature findings may be useful in the

daily clinical practice, such as:

-Anterior and anterior-lateral DDWR are the most common TMJ disc displacements;

-DDWR may be asymptomatic and may not require treatment, since the structures in this region may adapt to the different positions of the articular disc.

The predominant etiological factor is trauma. Therefore, the most important treatment should be aware the patient to minimize dental clench or any other parafunctional habit, which may cause excessive loads to the TMJ;

-Clinical diagnoses are reliable however the MRI is the gold standard to diagnose DDWR;

-Conservative treatments are always the first choice;

-Invasive techniques should be selected whenever conservative treatments are not enough to suppress the pain or improve the amplitude of mandible movements and;

-Clinicians should keep in mind that DDWR may evolve with self-resolution, passing through a symptomatic to an asymptomatic condition without any treatment.

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