Evaluation of the Research Diagnostic Criteria for Temporomandibular Disorders for the Recognition of an Anterior Disc Displacement with Reduction

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The authors of the Focus Article[1] present a comprehensive critique of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) for the diagnosis of an anterior disc displacement with reduction (ADDR) and, according to their data,[2] provide alternative criteria for the diagnosis of the two most common forms of internal derangement: the ADDR and the symptomatic condylar hypermobility.

The article is important and overdue but is likely coming too late, as new RDC/TMD criteria for the diagnosis of an ADDR will shortly be published. Nevertheless and with all their limitations, the criteria proposed by the authors are not only a simplification of but likely more appropriate than those proposed in the RDC, if one likes to differentiate between different forms of internal derangement.

The authors correctly argue that the two sets of criteria can lead to erroneous diagnoses, especially because the two sets of diagnostic criteria are all inclusive. Therefore, they suggest completely eliminating the second set of criteria and in the first one the 5 mm criterion, as the difference in mouth opening between the opening and closing click is seldom less than 5 mm.[3]

The second set of RDC addresses the diagnosis of those cases in which the closing click is not audible/palpable. Here the RDC require the presence of a clicking sound in protrusion or laterotrusion. The authors argued that in cases in which the disc reduction occurs late during the opening phase, disc reduction, and therefore the clicking sound, does not occur during protrusion or laterotrusion, simply because of insufficient condylar translation. However, lack of disc reduction in protrusion and laterotrusion can also occur with an intermediate and, in some cases, even with an early open click as we learned from condylar motion analysis recorded at our clinic by means of fluoroscopy, with and without contrast medium, and true dynamic magnetic resonance imaging (MRI). In these cases, the disc is simply pushed forward by the condyle, remaining in a displaced position.

In the absence of a closing click, the authors suggested checking whether this can be elicited when the compressive load in the temporomandibular joints (TMJ) is increased. This can be reached not only by applying, as proposed, a downwards force of about 30 N to the chin (that likely is counteracted by an increase in the contraction level of the elevators) but also by pulling the mandible cranially during the closing phase. Elicitation of the closing click is certainly a more correct approach to the diagnosis of an ADDR than the second set of RDC because, by definition, an ADDR is characterized both by a reduction and a displacement of the disc to the condyle.

In conclusion, the criteria proposed by the authors to diagnose an ADDR seem, based on actual knowledge, more appropriate than those of the RDC for the diagnosis of an ADDR. The carefully expressed conclusion derives from the fact that both the new and the RD criteria have never been validated. According to the authors, the RDC/TMD criteria only have a "face validity," and essentially rely on the assumption that a click is pathognomonic for an ADDR. This is, however, not always the case (see below). On the contrary, the authors of the Focus Article developed their diagnostic criteria from the evaluation of the kinematic center (KC) traces recorded simultaneously with joint sounds, but also these criteria have not been validated anatomically. A study comparing three diagnostic systems—the clinical examination, the functional, and the MRI evaluation—for the diagnosis of an anterior/posterior disc displacement

with reduction and a symptomatic condylar hypermobility reported a fair to good agreement between the functional and the clinical examination while the agreement between these two examinations and the MRI evaluation was poor.[4] The fair to good agreement between the first two techniques is not surprising as the clinical diagnostic criteria were derived from the functional examination (circular reasoning). Also the poor agreement with the anatomical TMJ characteristics is not unexpected as the agreement between clinical examination and MRI diagnoses greatly varies between studies and is often poor (details in Manfredini and Guarda-Nardini[5]). The partial volume effect and the low spatial resolution of MRI likely account for this, so that the condyle-disc position is not always easily detectable and only pronounced disc alterations in form and position can be seen. Moreover, a clicking sound can be elicited by other conditions other than that of an ADDR, for instance partial disc reduction, increased friction between disc and eminence, disc deformation, posterior and sideway disc displacement, or irregularities in the fossa articulating surface.[6]

There are also a few points that need clarification. The first relates to the KC; the concept of the KC is based upon the assumption that the movements of the condyle-disc complex can reasonably well be approximated by those of a ballshaped condyle-disc complex in which the KC is the center of the sphere and the KC traces are mainly produced by the morphology of the articular eminence, the radius of the ball-shaped condyle-disc complex and the amount of compression within the TMJ.[7] However, dynamic stereometry showed that the KC was mostly located outside of the condyle and that the form of the KC path did not reflect the fossa shape, the difference increasing the more distant the KC was from the condyle (see Fig 2 in Gallo et al[8]). Lastly, the distance between the KC and the main condylar axis depends on how the shape of the cranial part of the condyle deviated from that of a hemisphere: the larger the deviation, the greater the distance.[9] Thus, one has to realize that the KC path does not correspond to anatomical boundaries. On the other hand, authors may be correct requesting that, when analyzing the movement of a single condylar point, this has to be the KC, eg, the point less influenced by condylar rotation. Since, for instance, the relationship between opening angle and condylar translation is not always the same on opening and closing,[10] the shape of the traces of condylar points influenced by the rotatory component, could lead to different traces on opening and closing that, in turn, could be erroneously interpreted as "abnormal." The best technique to depict the actual condylar movement is still provided by dynamic stereometry which is a technique that allows for depicting the movement of the whole condyle within the fossa and for calculating the actual intraarticular distance variations. Unfortunately, this technique does not allow envisaging the disc. Disc mobility can be visualized by real dynamic MRI,[11] that, however, shows only pronounced changes and does not permit precise measurements because of the poor noise-to-signal ratio.

A second point relates to the explanation of why the closing click is often less loud, not to say not audible/palpable during the clinical examination. The authors suggest that this is because the condyle is less loaded on closing than on opening, a fact that they accept as not undisputed. Indeed, the minimum condyle-fossa distance is smaller during closing than opening.[8] Also finite-element modelling of intraarticular forces has indicated more compression during jaw closing than during jaw opening.[12] It is important to point out once more that the KC traces do not represent the actual joint anatomy (see Fig 2 in Gallo et al[8]), and although they are associated with the variations in the minimum condyle-fossa distance, they are neither identical to nor synchronized with them.[8] The fact that the closing click is softer and often not audible/palpable during the clinical examination is probably due to other causes. First, it is likely that more energy is needed to overcome the disc obstacle than for the disc to slide anteriorly when the condyle is translating posteriorly. Indeed in joints with an early opening click, the opening movement often starts by rotation, indicating that the dislocated disc can hinder the translatory movement. The closing movement in joints with a terminal click ends often by rotation because the condyle has already reached its more dorsal position at the time of clicking.[13] Also, a late closing click occurs when the translatory condylar velocity is decreasing while the opening click occurs when the translatory velocity is increasing or near to its maximum.[14] Finally, true dynamic MRI shows that during disc reduction on opening, the posterior movement of the disc in relation to the condyle is much faster and abrupt than what occurs when the disc is dislocating anteriorly during closing.

The third point concerns the click due to symptomatic condylar hypermobility that is synonymous of eminence click, and that has been reported to have a prevalence of approximately 10%.[2] Its diagnosis relies on the non-disappearance of the clicking sound during protruded open-close movements.

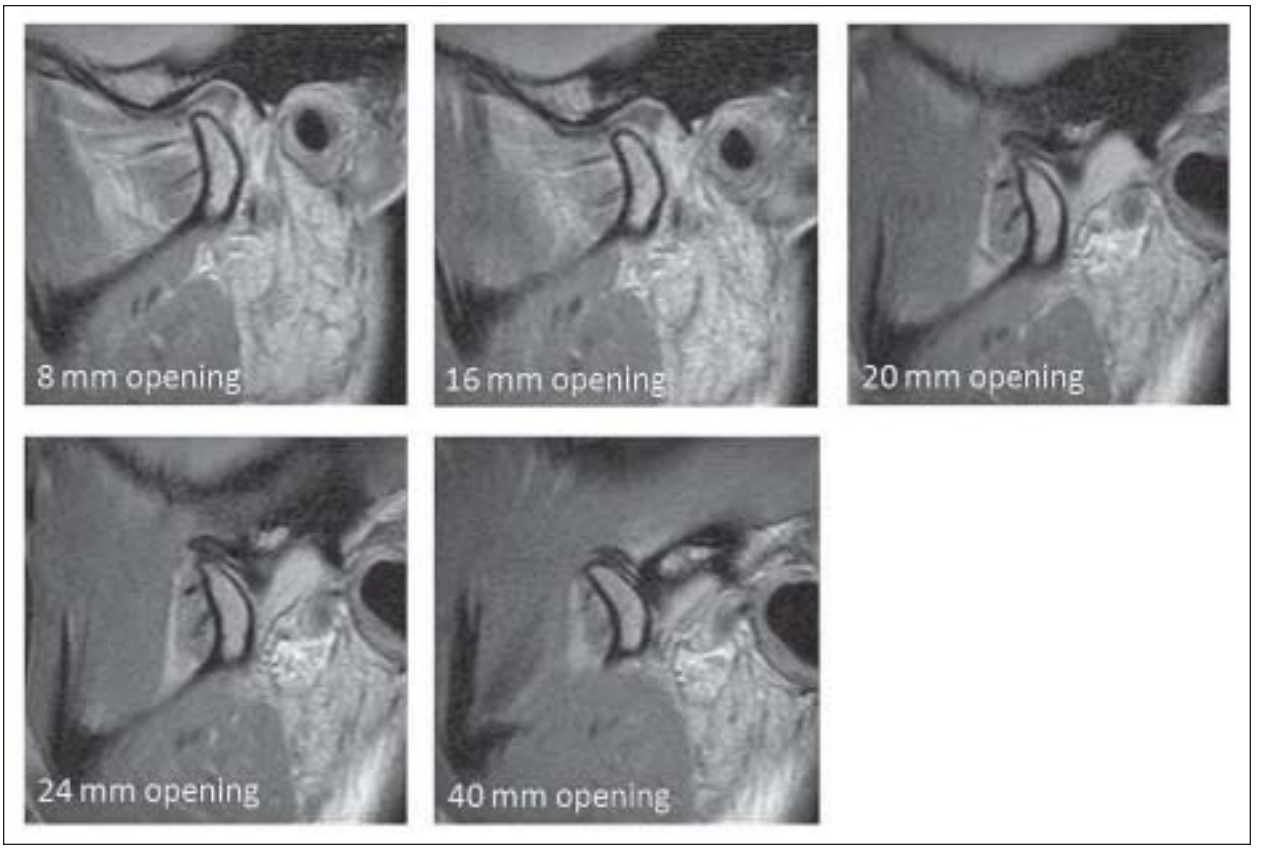

Fig 1 Example of the condylar translation in a subject with symptomatic condylar hypermobility and a normal condyle-disc relationship. Sequence of five positions during an opening movement. Notice *(1)* the minimum condylar translation during the first 16 mm of opening, *(2)* the large condylar translation between 16 mm and 20 mm of opening, and *(3)* the pronounced translation in front of the eminence. Dynamic MRI indicated a high acceleration of the condyle between 16 mm and 20 mm opening.

This is certainly correct, however, in cases in which the disc reduction occurs in the middle/late phase of opening and the displacement occurs in the middle phase of closing, the elimination test may provide a wrong diagnosis as the clicking sound likely does not disappear. The symptomatic condylar hypermobility is certainly an entity but, to my knowledge, the proposed criterion has never been validated and it is uncertain how often this criterion correctly diagnoses a symptomatic condyle hypermobility. It is likely that an analysis of the translatory velocity of the condyle during opening and closing could be of more diagnostic value than the suggested clinical maneuver. Dynamic MRI shows that the click in symptomatic condylar hypermobility is accompanied by a sudden and very pronounced acceleration of the condyle when it travels below the eminence, both on opening and closing (Fig 1). Thus, combination of static MRI to prove the condyle-disc relationship in maximum intercuspidation, combined with true dynamic MRI, should be used in order to validate the diagnostic criterion.

In conclusion, because of the lack of validation it is worth asking whether it is correct to make anatomically specific diagnoses, especially considering that these often do not have clinical implications, a conclusion that is pertinent also to the RDC. A clicking sound and an irregularity in the KC traces are, of course, the expression of an internal derangement. It seems therefore more reasonable to diagnose clicking joints simply as joints with internal derangement and leave the definitive diagnosis to those cases in which the clicking mechanism is confirmed by MRI. In the absence of anatomical confirmation, a clicking joint should simply be diagnosed as a "TMJ with internal derangement" with, at the most, the addition of "likely due to….". This does, of course, not imply that MRI must be taken for all clicking joints.

References

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