

Masticatory muscle disorders diagnostic criteria: the American Academy of Orofacial Pain versus the research diagnostic criteria/temporomandibular disorders (RDC/TMD)

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SUMMARY In this study, relevant cases were retrospectively reviewed to identify patients who were diagnosed as suffering from myofascial pain only according to the research diagnostic criteria/temporomandibular disorders (RDC/TMD) criteria, in order to examine whether or not they could fulfil the American Academy of Orofacial Pain (AAOP) diagnostic criteria for TMD-related masticatory muscle disorders. One hundred and twenty-seven patients, diagnosed according to the RDC/TMD criteria as having myofascial pain with or without limited jaw opening only, were allocated to two groups according to their answers to the RDC/TMD 'jaw disability checklist'. The two groups were compared for Axis I and II data taken from the RDC/TMD questionnaire. Thirty-eight of the patients (29.9%) did not associate their symptoms with jaw functions (e.g. chewing and yawning). This

group was characterised by increased range of motion (ROM) and older average age. The AAOP diagnostic criteria for TMD require pain on function in all subtypes of TMD-related muscle disorders. An association between pain and jaw function is common and research is needed to determine whether this should be categorised differently to muscle pain unrelated to jaw function. There may well be different pathophysiological mechanisms and consequently different management strategies for these two pain conditions.

KEYWORDS: research diagnostic criteria/temporomandibular disorders (RDC/TMD), American Academy of Orofacial Pain (AAOP), International Headache Society (IHS), masticatory muscle disorders

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Introduction

Temporomandibular disorders (TMD) are defined by the American Academy of Orofacial Pain (AAOP) as a collective term for a number of clinical problems, which involve the masticatory musculature, the temporomandibular joints (TMJs) and associated structures (1). Muscle-related conditions represent the largest subgroup among the various disorders grouped under the inclusive term of TMD (2). Depending on the diagnostic criteria used, the prevalence of this subgroup may range from 31.4% (3) to 88.7% of all TMD cases (2–6). Temporomandibular disorders-related myogenous pain is classified as musculoskeletal pain whose most dis-

tinctive characteristic is that it is related to the demands of biomechanical function in a graduated manner (7).

The International Headache Society (IHS) diagnostic criteria for headache or facial pain attributed to temporomandibular joint (TMJ) disorders refers only to the TMJ, while grouping muscle-related TMD under the tension type headache category (ICHD II, category 11.7, Table 1) (8). Therefore, the AAOP, while adhering to the IHS diagnostic criteria, details several disorders in its masticatory muscle disorders (MMD) subgroups, in order to meet the diagnostic process needed for assessing the muscle component of TMD (Table 2) (9). A review of the classification scheme of each MMD according to the AAOP reveals one criterion common

Table 1. Headache or facial pain attributed to temporomandibular joint (TMJ) disorders according to the international headache society (IHS) (8)

A. Recurrent pain in one or more regions of the head and/or face fulfilling criteria C and D
B. X ray, MRI and/or bone scintigraphy demonstrate TMJ disorder
C. Evidence that pain can be attributed to the TMJ disorder, based on at least one of the following
1. <i>Pain is precipitated by jaw movements and/or chewing of hard or tough food</i>
2. <i>Reduced range of or irregular jaw opening</i>
3. Noise from one or both TMJs during jaw movements
4. Tenderness of the joint capsule(s) of one or both TMJs
D. Headache resolves within 3 months, and does not recur, after successful treatment of the TMJ disorder

Bold italics indicate shared characteristics which refer to pain affected by jaw function.

to all the painful muscle diagnoses and a feature that reflects the musculoskeletal pain behaviour of MMD, and it is aggravated by the function of the affected muscles.

The research diagnostic criteria for TMD (RDC/TMD) were developed to enable consistent measurements and comparisons between different clinical research studies (10). The dual-axis diagnoses provide insight into both physical findings (Axis I) and psychosocial aspects (Axis II) of TMD. The RDC/TMD criteria have become a universally recognised research tool for studying TMD. In contrast to the AAOP diagnostic criteria for muscle disorders, the RDC/TMD criteria refer only to what were considered as being the most common muscle disorders, excluding myospasm, myositis, contracture, etc. According to the RDC/TMD criteria, there are two subcategories of group I muscle disorders: myofascial pain and myofascial pain with limited opening (Table 3) (10). Pain upon function is not mandatory for either of these two diagnoses; rather, pain either at rest or during function is required.

A critical review by Steenks and de Wijer (11) raised several important issues regarding the validity of the RDC/TMD criteria in clinical settings and proposed the need to modify and update the Axis I diagnostic criteria. The authors recognised that the scope of the RDC/TMD criteria is narrower than that of the AAOP classification. They also noted that although one of the most important characteristics of TMD is aggravation by mandibular function, such as chewing, yawning and speaking, this parameter is not included in the RDC/TMD history questionnaire pertaining to clinical examination and

Table 2. Diagnostic criteria of painful masticatory muscle disorders (MMD) according to the American Academy of Orofacial Pain (AAOP) (9)

Local myalgia	All of the following must be present
	1. <i>Regional dull, aching pain during function of the affected muscles</i>
	2. No or minimal pain at rest
	3. Local muscle tenderness to palpation
	4. Absence of trigger points and pain referral patterns
Myofascial pain	All of the following must be present
	1. Regional dull, aching pain at rest
	2. <i>Pain is aggravated by function of the affected muscle</i>
	3. Provocation of trigger point alters the pain complaint and often reveals a pattern of pain referral
	4. Greater than 50% reduction of pain with vapocoolant spray or local anaesthetic injection into the trigger point, followed by stretch
Centrally mediated myalgia	All of the following must be present
	1. History of prolonged and continuous muscle pain
	2. Regional dull, aching pain at rest
	3. <i>Pain is aggravated by function of the affected muscles</i>
	4. Pain is aggravated by palpation
Myospasm	All of the following must be present
	1. Acute onset of pain at rest as well as with function
	2. Markedly reduced range of motion because of continuous involuntary muscle contraction
	3. <i>Pain is aggravated by function of the affected muscle</i>
	4. Increased EMG activity grossly higher than at rest
	5. Sensation of muscle tightness or cramping or stiffness

Bold italics indicate shared characteristics which refer to pain affected by jaw function.

diagnosis. They suggested changing palpation protocols by eliminating problematic muscle sites (e.g. intraoral and submandibular) and creating a better balance between muscle and joint sites. In his commentary on Steenks and de Wijer's review (11), Greene (12) agreed with their point of view, noting that the RDC/TMD criteria failed to determine whether any correlation exists between reported pain and aggravation by mandibular function. This, in his opinion, is a cardinal weakness of the RDC/TMD criteria, as it hampers the process of determining whether or not the site of the pain is also the source of pain and not a manifestation

Table 3. Group I: Diagnostic Criteria of Muscle Disorders according to the research diagnostic criteria/temporomandibular disorders (RDC/TMD) criteria (10) and the revised RDC/TMD (18)

Diagnosis	Original RDC/TMD	Revised RDC/TMD
Myofascial pain	<p>1a. Pain of muscle origin, including a complaint of pain as well as pain associated with localised areas of tenderness to palpation in muscle</p> <p>1. Report of pain or ache in the jaw, temples, face, preauricular area, or inside the ear at rest or during function; plus</p> <p>2. Pain reported by the subject in response to palpation of three or more of the following 20 muscle sites (right side and left side count as separate sites for each muscle): posterior temporalis, middle temporalis, anterior temporalis, origin of masseter, body of masseter, insertion of masseter, posterior mandibular region, submandibular region, lateral pterygoid area and tendon of the temporalis. At least one of the sites must be on the same side as the complaint of pain</p>	<p>Pain history with confirmation of pain location: Have you had pain in the face, jaw, temple, in front of the ear or in the ear in the past month?</p> <p>Plus</p> <p>a. Report of familiar pain on examination:</p> <p>1) Palpation of muscle sites with minimum of 2 pounds of pressure (range, 2–3 pounds) results in a report of familiar pain:</p> <p>a. Palpation of temporalis: anterior, middle or posterior; or</p> <p>b. Palpation of masseter: origin, body or insertion</p> <p>Or</p> <p>2) Mandibular opening results in report of familiar pain anywhere in the temporalis or masseter muscles during:</p> <p>a. Maximum unassisted opening; or</p> <p>b. Maximum assisted opening (passive stretch)</p> <p>Plus</p> <p>Unassisted opening without pain of ≥40 mm (interincisal opening plus vertical incisal overlap)</p>
Myofascial pain with limited opening	<p>Limited movement and stiffness of the muscle during stretching in the presence of myofascial pain</p> <p>1. Myofascial pain as defined in 1a; plus</p> <p>2. Pain-free unassisted mandibular opening of less than 40 mm; plus</p> <p>3. Maximum assisted opening (passive stretch) of 5 or more mm greater than pain-free unassisted opening</p>	<p>Pain history with confirmation of pain location: Have you had pain in the face, jaw, temple, in front of the ear or in the ear in the past month?</p> <p>Plus</p> <p>Report of familiar pain on examination:</p> <p>1) Palpation of muscle sites with minimum of 2 pounds of pressure (range, 2–3 pounds) results in a report of familiar pain:</p> <p>a. Palpation of temporalis: anterior, middle or posterior; or</p> <p>b. Palpation of masseter: origin, body or insertion</p> <p>Or</p> <p>2) Mandibular opening results in report of familiar pain anywhere in the temporalis or masseter muscles during:</p> <p>a. Maximum unassisted opening; or</p> <p>b. Maximum assisted opening (passive stretch)</p> <p>Plus</p> <p>Unassisted opening without pain of less than 40 mm (interincisal opening plus vertical incisal overlap)</p>

Bold italics indicate shared characteristics which refer to pain affected by jaw function.

of heterotopic pain. Visscher *et al.* (13) compared the diagnostic accuracy of the RDC/TMD criteria for clinical examination using muscle palpation with dynamic/static clinical testing for the diagnosis of TMD-related orofacial pain. They concluded that it is better to rely on positive dynamic/static tests for confirmation of TMD-related pain.

A series of articles published recently addressed some of these important issues and proposed a revised diagnostic algorithm for the RDC/TMD, under the name of Diagnostic Criteria for TMD (revised RDC/TMD) (14–19) (Table 3). However, while the revised RDC/TMD has slightly improved sensitivity and specificity of myofascial pain diagnosis, pain upon

function is not mandatory for either of these two revised diagnoses for myofascial pain; rather, pain either at rest or during maximum unassisted mandibular opening without pain; or maximum assisted opening with pain is required for diagnosis of myofascial pain. Therefore, in that aspect, no substantial modifications were applied in the revised RDC/TMD.

In the light of these recent criticisms regarding the RDC/TMD and the revised RDC/TMD, the specific aim of this investigation was to compare the RDC/TMD (and the revised RDC/TMD) with regard to MMD to the AAOP diagnostic criteria, by retrospectively reviewing clinical cases of patients whose initial diagnosis of myofascial pain was established according to the original RDC/TMD criteria.

Materials and methods

Participants

The study population included all consecutive patients who were examined between 2001 and 2004 in the Orofacial Pain Clinic of the School of Dental Medicine, Tel Aviv University (Israel) and diagnosed as having myofascial pain with or without limited opening (group 1 muscle disorders) according to the RDC/TMD criteria. Examination protocol adhered to the RDC/TMD examination protocol. Calibration to the protocol was performed by the senior author who was calibrated to the RDC/TMD examination protocol during her studies at the Oral Medicine Program, University of Washington; thereafter, calibration between the senior author and the other members of the department was performed. As a recent examination of the validity of the original axis I diagnoses of the RDC/TMD showed that the diagnosis of 'myofascial pain' achieved the desired diagnostic accuracy for both sensitivity and specificity (0.87 and 0.98, respectively) (16), while the revised diagnostic criteria only slightly increased the validity of a diagnosis of myofascial pain to a sensitivity of 0.91 and specificity of 1.00, (18) we felt confident in using our old data, which referred to the original RDC/TMD diagnostic criteria algorithm for myofascial pain.

Exclusion criteria were as follow: age younger than 18 years, additional multiple diagnoses as allowed by the RDC/TMD criteria (e.g. disc displacement with/without reduction, arthralgia/osteoarthritis/osteoarthrosis), an answer of 'yes' to the question 'have you had a recent injury to your face or jaw' and failure to complete the

answer to question 19 of the RDC/TMD criteria (jaw disability checklist, Table 4).

Procedure

Patients were allocated to two groups according to their answer to the 'jaw disability checklist' published in the original RDC/TMD history questionnaire (question 19 in the original RDC/TMD questionnaire) (10). This checklist includes 12 functions of the jaws, such as chewing, yawning and talking, and the patient was instructed to indicate the activities that are prevented or limited by the presenting jaw problem (Table 4). Acknowledging that the jaw disability checklist does not specify 'pain', rather 'jaw problem' in its question, patients diagnosed with group 2 or 3 according to the RDC/TMD (disc displacement with/without reduction, osteoarthritis/osteoarthrosis and arthralgia) were excluded, leaving the only jaw problems to be pain or limitation of opening because of pain. As myofascial pain patients suffer from pain as part of their syndrome, a negative answer to this list really meant that these functions did not aggravate their existing pain. Patients who gave a positive answer to one or more of the 12 specified activities were assigned to a 'positive jaw functional disability myofascial pain group' (MPD+), while those who gave a negative answer to all 12 activities were assigned to a 'negative jaw functional disability myofascial pain group' (MPD-). The two groups (MPD+ and MPD-) were compared according to information obtained by the RDC/TMD criteria as follows:

Axis I data

- 1 Number of muscles sites palpated. Following recent criticisms of problematic muscle sites, such as the intraoral and submandibular ones (11), and the recommendations of Visscher *et al.* (13) that the intraoral and submandibular palpation sites that make up part of the RDC/TMD criteria can be omitted without losing diagnostic accuracy, and following the revised RDC/TMD which includes only the temporalis and masseter muscles (18), only the temporalis and masseter muscle sites (12 sites altogether) were compared;
- 2 Range of motion (ROM) (maximum unassisted mandibular opening without pain and maximum assisted opening with pain);
- 3 Characteristic pain intensity (CPI), (calculated by averaging the current pain level, the worst pain level and the average pain level required;

Table 4. Jaw function questionnaire: jaw disability checklist (10)

What activities does your present jaw problem prevent or limit you from doing?		
Activity	No	Yes
Chewing		
Drinking		
Exercising		
Eating hard foods		
Eating soft foods		
Smiling/laughing		
Sexual activity		
Cleaning teeth or face		
Yawning		
Swallowing		
Talking		
Having your usual facial appearance		

4 Time interval between onset of symptoms and the current clinical examination;

5 Demographic data, socioeconomic status (the latter according to education level and income).

Axis II parameters

1 Depression;

2 Somatisation (pain items included/excluded);

3 Chronic pain grade (CPG).

Results

During the relevant time period, a total of 329 patients were diagnosed as having myofascial pain with or without limited opening. Forty patients were excluded because of age younger than 18 years, 138 because of multiple diagnoses, 22 for reporting a recent injury to the face or jaw and two for having failed to complete the answer to question 19 of the jaw disability checklist.

Of the 127 patients who comprised the final study group, 93 (18 men and 75 women; mean age 40.0 ± 15.6 years; range, 18–84 years) were diagnosed as having myofascial pain without limited opening, and 34 (three men and 31 women; mean age 36.7 ± 14.9 years; range, 18–73 years) were diagnosed as having myofascial pain with limited opening.

According to their replies to the jaw disability checklist, 38 patients (29.9%) belonged to the MPD– group and 89 patients (70.1%) to the MPD+ group. The MPD– subjects did not fulfil the AAOP criteria for MMD, as their dysfunction was not aggravated by

function of the affected muscles, a criteria that are required in all painful MMD according the AAOP diagnostic criteria (Table 2). The MPD– subjects were significantly older than the MPD+ subjects (43.7 ± 15.8 and 37.1 ± 14.9 years, respectively; $P < 0.05$ *t*-test). Both unassisted opening without pain (MPD– 46.3 ± 7.2 mm, MPD+ 41.1 ± 11.0 mm, $P < 0.01$) and maximum assisted opening with pain (MPD– 51.4 ± 4.4 mm, MPD+ 48.4 ± 8.1 mm, $P < 0.01$) were significantly higher among the MPD– subjects compared to the MPD+ subjects ($P < 0.01$, *t*-test). There were no significant differences in the other selected parameters: number of muscles sites palpated (*t*-test), duration of symptoms (*t*-test), CPI (*t*-test), gender (chi-squares test), education level (*t*-test), income level (chi-squared test), CPG (chi-squared test), somatisation (pain items included) (*t*-test), somatisation (pain items excluded [*t*-test]) and depression (*t*-test).

Discussion

The present study shows that approximately 30% of the patients with muscle pain-related disorders, who were initially assigned a diagnosis of group 1 muscle disorders according to the RDC/TMD, did not associate their pain with jaw function. This group was characterised by an older age and by increased ROM, as compared to the MPD+ group. The results presented hereby are in accordance with the epidemiological data, which were used to develop the original RDC/TMD criteria (20); where 97% of the clinical cases which were taken from a tertiary orofacial pain clinic sought treatment for relief of pain, but only about 50% reported pain during function. This highlights the first fundamental difference between the AAOP diagnostic criteria, the RDC/TMD and the revised RDC/TMD: the AAOP diagnostic criteria for TMD require pain on function in all subtypes of TMD-related muscle disorders, while the RDC/TMD and the revised RDC/TMD do not.

It is interesting to note, however, that the revised RDC/TMD project, aimed first of all at diagnosing TMD cases, before validation of the RDC/TMD was undertaken, applied a gold standard diagnosis process, which included an initial screening questionnaire, a supplemental questionnaire which assessed the association between jaw function and pain and clinical examination by criterion examiners (CE). This resulted in 99% of the participants who received a gold standard TMD pain diagnosis (495 out of 500) reporting that their pain

was modified by movement, function, parafunction and/or rest (18).

The revised RDC/TMD project has demonstrated therefore the efficacy of questionnaires and a clinical detailed examination in identifying TMD cases prior to applying the revised RDC/TMD. Questionnaires which include an association between function and pain for correctly identifying TMD cases have been used by various studies. (21, 22), and recently, a validated version of the jaw functional limitation scale has been created and posted on the RDC/TMD Consortium Internet site (23). Indeed, the authors of the revised RDC/TMD note that '...it is very possible that questions regarding the effect of jaw function and movement on pain may be useful in distinguishing TMD from other orofacial pain conditions' (19). This is in accordance with the recommendation of the revised RDC/TMD project that the 'revised RDC/TMD be used in clinical and research settings after other orofacial pain conditions...have been ruled out' (19). This brings us to the second fundamental difference between the RDC/TMD and the revised RDC/TMD on the one hand, and the AAOP diagnostic criteria for TMD on the other hand: while the former applies the criteria only to TMD patients, the latter attempts both to distinguish between TMD cases and other orofacial pain conditions, by including pain upon function in its diagnostic criteria for all painful TMD-related muscle disorders, and thereafter to further divide the TMD patients into subgroups. For research purposes, this setting of the RDC/TMD may work while attempting to characterise TMD patients. However, in a clinical orofacial pain setting, any diagnostic criteria should include the tools needed to first identify true cases of TMD. Indeed, one might argue that ruling out non-TMD patients is as important if not more important than diagnosing TMD cases (24–26). Applying the revised RDC/TMD to TMD patients in an orofacial pain clinic is equivalent to applying cluster headache diagnostic criteria according to the IHS only to cluster headache patients in a headache clinic.

It should be borne in mind that the present study involved a relatively limited number of patients in one centre only, and that the data was based on retrospective analysis. In addition, while the jaw disability checklist refers to 'jaw problem', our study evaluated the effect of pain on function. The RDC/TMD protocol requires excluding patients who were diagnosed with muscle disorders such as muscle spasm, myositis, contracture and history of trauma, prior to the use of the RDC criteria

(10). In addition, all patients who were diagnosed with group 1 (disc displacement) and group 3 (arthralgia, arthritis, arthrosis) were excluded from the study. The study group therefore included patients who suffered from jaw disability associated with muscle pain only. Thus, this study is not without its limitations and should be viewed as a preliminary study aimed to highlight an issue of paramount importance, which still needs to be addressed in order to enable transforming the revised RDC/TMD into valid clinical diagnostic criteria for TMD.

Future research should focus on establishing a protocol for diagnosis of TMD-related pain, prior to applying the revised RDC/TMD, while using a combination of questionnaires which specifically addresses limitation of jaw function because of pain and clinical tests, such as those used by the clinical experts in the revised RDC/TMD project (14) (joint play test, static and dynamic tests, bite tests, one minute clench, algometry, soft and hard end feel and joint loading). Indeed, this may enable to identify a subgroup of orofacial pain patients, as presented hereby by the MPD- group, which is unrelated to TMD. The authors of the revised RDC/TMD project acknowledge that 'distinguishing the pain of TMD from that of other pain conditions, which may have associated referred pain, hyperalgesia, allodynia and central sensitisation presenting in the masticatory region is difficult using the RDC/TMD' (19). Adding this protocol may be what is needed for transforming the RDC/TMD from a research tool into a revised RDC/TMD used in the clinical setting as well. Over a decade ago, Stohler noted that 'The muscle-related TMD should not be understood as a single, discrete disease entity. Instead, a number of related and often overlapping conditions are included under this umbrella term...' (2) Over a decade later, the proposed term 'persistent idiopathic muscle pain' to chronic muscle pain'' is worrisome (27). It is our contention that this might repeat the mistake made decades ago in applying the term TMD (28). As expressed by Benoliel (29), 'TMD is essentially an umbrella classification.' Applying an umbrella term to MMD will severely hamper any further research trying to understand the pathophysiology of the different subclasses of MMD. Incorporation of the AAOP diagnostic criteria for MMD into the RDC/TMD and further collaboration with other specialists, such as orthopaedists, neurologists, psychiatrists and rheumatologists will enable better understanding of the different aetiologies which present clinically as masticatory muscle disorders.

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