Comparing TMD Diagnoses and Clinical Findings at Swedish and US TMD Centers Using Research Diagnostic Criteria for Temporomandibular Disorders

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The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) guidelines, originally developed in the United States, were translated and used to classify TMD patients on physical diagnosis (Axis I) and pain-related disability and psychologic status (Axis II) in a TMD specialty clinic in Sweden. The objectives of the study were to determine if such a translation process resulted in a clinically useful diagnostic research measure and to report initial findings when the RDC/TMD was used in cross-cultural comparisons. Findings gathered using the Swedish version of the RDC/TMD were compared with findings from a major US TMD specialty clinic that provided much of the clinical data used to formulate the original RDC/TMD. One hundred consecutive patients were enrolled in the study. Five patients with rheumatoid arthritis and 13 children or adolescents were excluded. The remaining 82 patients participating in the study comprised 64 women and 18 men. Group I (muscle) disorder was found in 76% of the patients; Group II (disc displacement) disorder was found in 32% and 39% of the patients in the right and left joints, respectively; Group III (arthralgia, arthritis, arthrosis) disorder was found in 25% and 32% of the patients in the right and left joints, respectively. Axis II assessment of psychologic status showed that 18% of patients yielded severe depression scores and 28% yielded high nonspecific physical symptom scores. Psychosocial dysfunction was observed in 13% of patients based on graded chronic pain scores. These initial results suggest that the RDC guidelines are valuable in helping to classify TMD patients and allowing multicenter and cross-cultural comparison of clinical findings.
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D espite methodologic differences,[1] several epidemiologic studies seem to agree that signs and symptoms of temporomandibular disorders (TMD) are common in the population.[2–6] For example, in the United States, a major population-based longitudinal study[4] found TMD pain to have a prevalence of 12%, but it was also observed that some signs of TMD, notably temporomandibular joint (TMJ) sounds, were also prevalent in about 25% of asymptomatic control subjects. Two of the critical shortcomings severely limiting the generalizability of almost all of

these studies are *(1)* lack of operational criteria with demonstrated scientific reliability for measuring or assessing clinical signs and symptoms of TMD, and *(2)* absence of clearly specified criteria for the muscle and/or joint conditions or subtypes of TMD (eg, myofascial pain disorder, internal derangements, degenerative joint disease). For example, many studies use limitations in range of motion as a criterion for particular subtypes of TMD (eg, myofascial pain dysfunction, disc displacement without reduction); however, precise definitions for "limited" range of motion (eg, < 30 mm or ≤ 40 mm) are not systematically provided by most available TMD diagnostic systems. Specifications of such measurement criteria are considered as essential requirements for establishing the reliability and validity of any clinical diagnosis.[7]

Further complicating the diagnosis of TMD is the presence of negative or maladaptive behavioral, emotional, and psychosocial factors, which have been extensively documented in patients with TMD.[8] Although patients with TMD present with varying physical signs and clinical symptoms, the predominant reason TMD patients seek treatment and the predominant treatment goal for TMD clinicians is relief of persistent symptoms of pain.[9–11] Because there is widespread agreement that chronic pain involves psychologic, behavioral, and social factors in addition to physical pathology, the complete assessment of TMD generally includes evaluation of these so-called *biobehavioral* factors.[12] However, there have been few systematic attempts to integrate behavioral, emotional, and psychosocial findings into a coherent diagnostic or assessment scheme for TMD. Important and highly valuable exceptions are the multiaxial classification system for chronic pain developed by the International Association for the Study of Pain[13] (IASP) and the Multidimensional Pain Inventory (MPI) developed by Turk and Rudy.[14] Although the IASP classification system accounts for physical and behavioral factors on its separate axes, it lacks the specificity necessary to distinguish one type of TMD from another. The MPI is limited to classifying only behavioral or psychosocial factors and pain, classifying pain patients according to level and type of psychosocial functioning. The MPI does not simultaneously incorporate classification of pain patients according to physical or pathophysiologic findings.

Several diagnostic systems are available to classify TMD patients based on clinical symptoms and to cluster patients into diagnostic subgroups.[10,11,15–21] Comparisons of these systems and comparisons of patients whose diagnoses have been based on these different systems are difficult to perform because they vary widely in their criteria for clinical signs and symptoms and for defining clinical cases. The most carefully developed and clinically useful of these systems, such as the Guidelines for Classification, Assessment, and Management,[10] still lack suitable operational criteria to allow adequate evaluation of their reliability and validity when making comparisons across clinicians or across different treatment centers. It has been demonstrated,[22] for example, that lack of agreement in even modest diagnostic criteria between two otherwise fairly comparable diagnostic systems can nevertheless lead to misclassifying up to one third of clinic cases.

As an initial step to address these shortcomings, Research Diagnostic Criteria for Temporomandibular Disorders[20] (RDC/TMD) have recently been developed and made available to researchers and clinicians for scientific evaluation. The RDC/TMD uses clinical examination and history-gathering methods with scientifically demonstrated reliability for gathering clinical signs of TMD, and it also includes assessment of behavioral, psychologic, and psychosocial factors. These RDC/TMD guidelines have been presented in detail elsewhere,[20] including specific clinical examination procedures to ensure reliable assessment of TMD signs.

The RDC/TMD is based on a dual axis system that allows a physical diagnosis based on pathophysiology to be placed on one axis (Axis I). This is coordinated with an assessment of TMD-related parafunctional behaviors, psychologic distress, and psychosocial dysfunction on a second axis (Axis II). Data for initial development of the RDC/TMD were gathered in longitudinal studies of TMD and other chronic pain conditions conducted collaboratively by the Department of Oral Medicine, University of Washington, Seattle, WA, and the Group Health Cooperative (GHC) of Puget Sound, WA, a large Health Maintenance Organization (HMO) comprising approximately 400,000 enrollees in the Pacific Northwest region of the United States.

The objective of the present study was to explore the usefulness of the RDC/TMD for gathering research-relevant and clinically relevant data in an international study. Specifically, the aim was to determine if a Swedish version of the RDC/TMD would be *(1)* acceptable to Swedish patients, *(2)* readily incorporated into a large Swedish TMD clinic, and *(3)* capable of generating data that could be compared with those obtained in the TMD specialty clinic of GHC.

Materials and Methods

The RDC/TMD involves use of a carefully specified history questionnaire and clinical examination to derive a clinical TMD diagnosis on Axis I and a psychosocial assessment on Axis II.

Axis I (Clinical Examination): Diagnostic Classification of the Most Common TMD Subtypes

Detailed specifications are provided for conducting a reliable clinical examination to yield RDC/TMD diagnoses of the most common types of TMD.[20] The RDC/TMD clinical examination involves clinical assessment of TMD signs and symptoms, summarized as follows:

Pain Site. Assessment of presenting pain as ipsilateral or contralateral to pain provoked by clinical examination of masticatory muscles and by tests of jaw function was done.

Mandibular Range of Motion (in Millimeters) and Associated Pain. Jaw opening patterns were assessed for corrected/uncorrected deviations in jaw excursions during vertical jaw opening. The vertical range of motion of the mandible (extent of unassisted opening without pain, maximum unassisted opening, maximum assisted opening) was measured. The extent of mandibular excursive movements (extent of lateral and protrusive jaw excursions) was recorded.

Temporomandibular Joint Sounds. Assessment by palpation of clicking, grating, and/or crepitus joint sounds during vertical, lateral, and protrusive jaw excursions was done.

Muscle and Joint Palpation for Pain or Tenderness. The extraoral masticatory and related muscles (n = 18 muscle sites) and the TMJ (n = 4 joint sites) were palpated bilaterally.

Temporomandibular Joint Imaging. The RDC/TMD relies on clinical findings for arriving at a diagnosis. However, for certain diagnostic categories, imaging is also recommended if available. Temporomandibular joint tomographs were obtained from 14 of the patients in the Swedish group to confirm RDC/TMD diagnoses related to arthroses and internal derangements of the articular disc. The tomograph specifications for a positive diagnosis of osteoarthrosis are that tomographs show one or more of the following: (1) erosion of normal cortical delineation; (2) sclerosis of parts or all of the condyle and articular eminence; (3) flattening of joint surfaces; or (4) osteophyte formation. In addition, magnetic resonance images were obtained from four of these subjects. The magnetic resonance imaging (MRI) specifications recommended by the RDC/TMD for disc displacement without reduction are as follows: (1) in the intercuspal occlusal position, the posterior band of the disc is clearly located at or anterior to the 11:30 position; and (2) on full opening, the posterior band remains clearly anterior to the 12:00 position.

The senior author (TL) gathered all the clinical data after his techniques had been calibrated, according to RDC/TMD guidelines for administration of the clinical examination and history questionnaire, through a training program at the Department of Oral Medicine, University of Washington.

The RDC/TMD groups the most common forms of TMD into three diagnostic categories and allows multiple diagnoses to be made for a given patient. The RDC/TMD diagnostic groups are:

Group I.   **Muscle Disorders**
  a.   Myofascial pain
  b.   Myofascial pain with limited opening
Group II.   **Disc Displacements**
  a.   Disc displacement with reduction
  b.   Disc displacement without reduction, with limited opening
  c.   Disc displacement without reduction, without limited opening
Group III.   **Arthralgia, Arthritis, Arthrosis**
  a.   Arthralgia
  b.   Osteoarthritis of the TMJ
  c.   Osteoarthrosis of the TMJ

Axis II (Psychosocial Assessment): History Questionnaire

The history questionnaire includes 31 questions covering information devoted to demographics and Axis II psychosocial assessment. Questions about age, gender, ethnicity, education level, marital status, and income level provided demographics information of the study population. Pain intensity was assessed with visual analog scales and temporal patterns of TMD-related pain. Oral habits and other possible risk factors, assessed as a summary score of limitations in ability to use the jaw, provided data pertaining to parafunctional behaviors and jaw disability. The psychologic status was assessed through depression and nonspecific physical symptom scores measured with subscales of the Symptom Checklist–90 Revised (SCL-90-R).[23] Psychosocial functioning was assessed through the graded chronic pain scale, which yields a score of 0 to IV (0 = no pain; IV = severe dysfunction), reflecting the severity and impact of TMD on interference with usual functioning at home, work, or school and incorporating disability days (loss of work days) because of TMD pain.
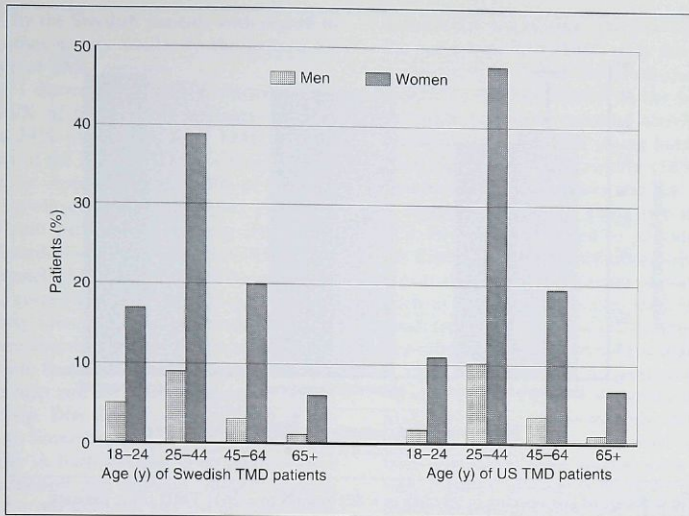
Fig 1 Distribution of Swedish (n = 82) and US (n = 261) TMD patients by age and gender.

The history questionnaire was translated into Swedish, and seven demographic questions from the original English (US) version were modified to better reflect Swedish conditions. The Swedish version was proofread by three TMD specialists (Professor G. E. Carlsson, Göteborg University; Professor M. Helkimo and Docent T. Magnusson, The Institute for Postgraduate Dental Education, Jönköping, Sweden) to validate the translation. The Swedish version was then translated back into English and compared with the original version. A pilot study was conducted on 12 patients to confirm that the resulting Swedish versions of Axes I and II were understandable and acceptable to clinic patients.

Subjects

One hundred new consecutive patients referred to the TMD Center in Linköping, Sweden, entered the study in 1994. All patients underwent a TMD clinical examination and completed the RDC/TMD questionnaire according to the RDC/TMD specifications.[20] All patients were referred from family and specialist medical practitioners and dentists in the community to the TMD Center, which is the only regional resource for diagnosis and management of TMD in Östergötland County, Sweden (population approximately 415,000). The comparison group was 247 consecutive TMD subjects

referred to the TMJ Clinic of GHC; these subjects comprise the primary group from which the RDC/TMD was developed.

Exclusion criteria for the Swedish group were as follows: patients younger than age 18 years (because several questions were difficult to understand or inappropriate) and patients with medically diagnosed polyarthritis were excluded. The exclusion criteria for the US group were the same.

All statistical analyses were performed at the University of Washington using SAS (version 6, ed 4, SAS Institute, Cary, NC) to derive frequency distributions and descriptive statistics for the Swedish group and to allow comparisons between Swedish and US groups of TMD patients.

Results

Patient Characteristics

Of the 100 consecutive referrals to the TMD Center, 18 were excluded from the present study because of age (13 adolescents were younger than 18 years old) and five because of the presence of medically diagnosed rheumatoid arthritis. Analyses reported below are for the remaining 82 TMD patient referrals. The age-gender distribution of the 82 Swedish patients is given in Fig 1. Sixty-
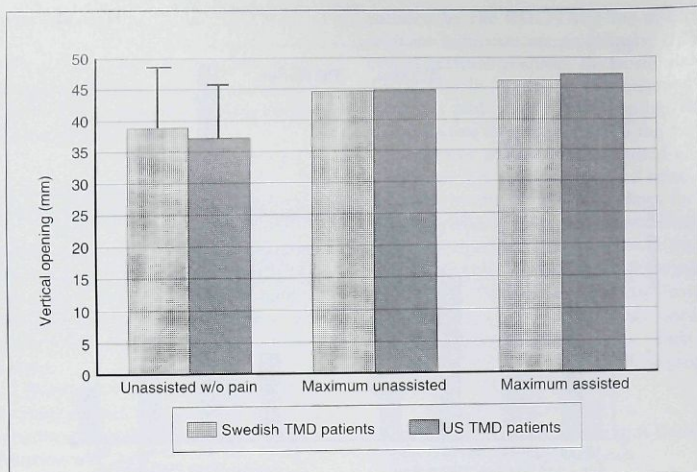
Fig 2 Range of jaw opening in Swedish (n = 82) and US (n = 261) TMD clinic patients.

Table 1 Comparison of Mean Values for TMD Pain Intensity, Pain Duration, and Pain-Related Interference With Daily Living

	Sweden		US	
	Mean	SD	Mean	SD
Pain intensity (VAS)	4.6	2.2	4.0	2.6
Pain duration (years)	5.7	10.0	8.3	11.1
TMD pain interference (0 to 10 VAS) with:				
Daily activities	2.0	2.2	2.2	2.5
Ability to work	1.6	2.2	1.4	1.8

four patients (78%) were women, with a mean age of 41.1 years (range of 18 to 77 years); 18 patients (22%) were men, with a mean age of 38.8 years (range of 18 to 86 years). The Swedish group had a gender ratio of 3.6:1, compared to the woman-man ratio in the US group of 5.0:1. Figure 1 also includes the age-gender distribution for the US clinic group, which showed a range of 18 to 82 years. The patients were overwhelming white in both clinics and at least moderately well educated.

Pain Characteristics

As seen in Table 1, mean pain intensity was 4.6 ± 2.2, for the Swedish group, and 4.0 ± 2.6 for the U.S. group. Swedish patients had a mean pain

duration of 5.7 years (3.7 years for women and 7.3 years for men). Pain was reported in 83% of patients and was the main reason for 73% of Swedish patients seeking treatment. Other reasons for seeking treatment were tiredness/stiffness (9%); clicking/catching of the TMJ (7%); locking/temporary dislocation (5%); attrition, sensitive teeth (5%); and crepitus (1%). By contrast, in the US group, 95% of patients reported pain.

Axis I: Clinical Findings

Mandibular Range of Motion. Measurements of the vertical range of motion of the mandible—unassisted opening without pain, maximum unassisted opening, and maximum assisted opening—are shown in Fig 2 along with values for the US group, which are very comparable.

RDC/TMD Diagnoses. The patients were classified into one or more of the three diagnostic groupings created by the RDC/TMD for classifying the most common forms of TMD. The diagnoses resulting from the RDC/TMD examination are summarized in Figs 3a to 3c together with comparable US data. As can be seen from these figures, muscle disorder diagnoses were the most common, occurring approximately twice as often as internal derangement diagnoses. Diagnoses of degenerative joint disease, except for arthralgia (ie, pain in the TMJ), were very infrequent. The pat-

tern shown by the Swedish patients with regard to TMD diagnoses is very similar to the pattern for the US group of TMD patients.

A Group I disorder, or muscle disorder, was found in 76% of the Swedish patients—that is, only about 24% of subjects with TMD did not meet criteria of the RDC/TMD for a muscle disorder diagnosis. Approximately 50% of patients exhibited myofascial pain, and 26% exhibited myofascial pain with limited opening (Fig 3a). A Group II disorder—disc displacement—was found in approximately 32% and 39% of the right and left joints, respectively, in the Swedish group, while slightly lower rates were found in the US group. More specifically, disc displacement with reduction was found in approximately 28% and 34% of the right and left joints, respectively, in the Swedish group. Disc displacement without reduction and with limited opening was found in 0% to 4% of joints in both groups. Disc displacement without reduction and without limited opening was found for one left joint and for no right joints in the Swedish group and at only slightly higher rates in both joints for the US group (Fig 3b). A Group III disorder—arthralgia, arthritis, or arthrosis—was found in 25% of the right and 31% of the left joints of the Swedish patients (Fig 3c). More specifically, arthralgia was found in 16% of the right and 23% of the left joints. Arthralgia was a much more prevalent diagnosis in the US group, hovering between 43% and 38% for the right and left joints, respectively. In the Swedish group, osteoarthritis was found in 5% of the right and 4% of the left joints, while osteoarthrosis was found in 4% of the right and 6% of the left joints.

Joint Imaging (Swedish Patients Only). The tomograph images of 14 patients revealed three right and seven left joints with osteoarthrosis. In 16 of the 28 joints (57%), the radiographic findings agreed with the RDC/TMD Group III diagnosis. In four of these subjects, MR images were also obtained, and a disc displacement without reduction was found in one right and three left joints. In five of these eight joints, the radiographic findings agreed with the clinical RDC/TMD Group II diagnoses. No comparable radiographic data were available for the US group.

Axis II: Psychosocial Assessment

Jaw Disability. The jaw disability checklist of the RDC/TMD is a composite of 12 items concerning limitations in activities related to mandibular functioning. The checklist measures the number of activities limited—not the degree of limitation in mandibular functioning. The jaw disability checklist is the only RDC/TMD scale that has not been evaluated for its reliability or relationship to other aspects of the RDC/TMD. In the Swedish group, the most frequently reported activities that were impaired by TMD were eating hard food (67%), chewing (60%), and yawning (58%). The mean number of limited activities was 2.4.

Psychologic Status. Thirty-two items from the SCL-90-R were included to provide scale scores for depression and somatization—the tendency to report disturbing nonspecific physical symptoms, such as heart palpitations, tremors, etc.[23] The mean (standard deviation [SD]) values for age- and sex-adjusted depression and somatization were 0.55 (1.4) and 0.7 (1.6), respectively, for the Swedish group. Figure 4 shows the distribution of high, normal, and moderately elevated scores, based on normative values derived for these scales from population-based studies of the GHC population. Eighteen percent of Swedish patients yielded severe depression scores, and 28% achieved severe levels of somatization scores using these US-derived standards; data for the US group were quite similar (Fig 4).

Psychosocial Assessment. Several measures of the impact of TMD on psychosocial functioning are summarized in Table 1, using individual visual analog scale scores (0 to 10, whereas 0 = no pain, 10 = worst pain imaginable) to allow comparison in the Swedish and US groups. For the Swedish group, mean impairment in daily living because of facial pain was rated as 2.0 for impact on overall daily activities. Thirteen percent of the patients reported that they had been kept from normal activities 1 or more days in the last 6 months because of facial pain, and 7% were on full-time sickness pension because of chronic pain.

The RDC/TMD uses a graded chronic pain scale developed to more accurately quantify the level of pain-related psychosocial function.[24] The graded chronic pain scale uses seven questions concerning pain intensity, interference in daily activities, and disability days for a 0-to-IV scale score, where Grade 0 = no TMD pain and no pain-related disability; Grade I = low pain intensity (VAS for pain intensity < 5/10) and low pain-related disability; Grade II = high pain intensity (VAS ≥ 5/10) and low pain-related disability; Grade III = moderately limiting disability; and Grade IV = severely limiting disability (eg, TMD-related days lost at work). Grades III and IV are typically associated with high pain intensity and TMD-related lost work days. The development of the graded chronic pain scale has been fully described elsewhere,[24] and sev-
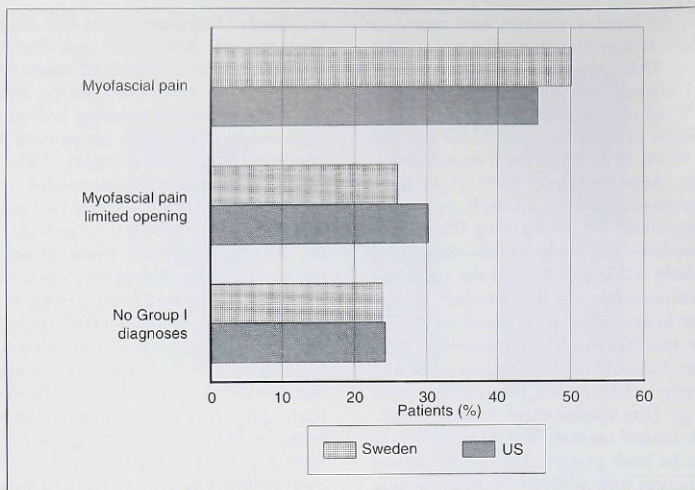
Fig 3a Distribution of RDC/TMD Axis I diagnoses—Group I: muscle disorders.

eral reports are available[25] describing the distribution of graded chronic pain scores for several types of chronic pain, for example, comparing TMD patients with chronic headache and back pain patients. The distribution of patients according to graded chronic pain severity (0 to IV) is given in Fig 5 for the Swedish and US groups. Pain patients yielding Grades I and II have been considered as psychosocially functional, revealing minimal interference or disability associated with their daily lives and attributed to their chronic pain condition. Grades III and IV are considered to indicate psychosocially dysfunctional levels of pain-related disability, indicating a greater impact on activities of daily living. Grades III and IV have also been shown to be associated with elevated scores on the SCL-90-R depression and somatization scales. For the Swedish subjects with TMD, 13% exhibited dysfunctional chronic pain (Grade III and IV), which is lower than the approximately 20% found in the US clinic subjects.

Discussion

The RDC/TMD was developed through the collaborative efforts of clinical researchers and TMD specialists from several major US university-based clinics specializing in the diagnosis and treatment of TMD.[20] The major purpose was to develop common methods for reliably examining TMD patients in different settings and for arriving at a diagnostic classification system that was based, to the largest extent possible, on available data of known reliability. Thus, the RDC/TMD was offered primarily as a research instrument, for which reliability and validity could be established over a series of studies in different clinical settings. Furthermore, these criteria are intended to facilitate comparisons across clinical and epidemiologic studies of the most commonly occurring subtypes of TMD. The present study evaluates, for the first time, whether the RDC/TMD can be used to make international comparisons of TMD clinic patients in two clinical populations separated by wide geographic distance, language, and culture, and it presents results of such comparisons for both physical (Axis I) and behavioral or psychosocial (Axis II) findings.

The most striking aspect of the results of this cross-cultural study is the remarkably high degree of concordance between the Swedish and US TMD clinic subjects. The profile for prevalence of TMD-related pain, used to define TMD, is essentially the same for both groups (see Fig 1), especially with regard to the large representation of women of child-bearing age in both groups. There appeared to be a tendency for the Swedish clinic to treat more young patients in the 1-to-24-year age group, but we do not have adequate data for the US clinic
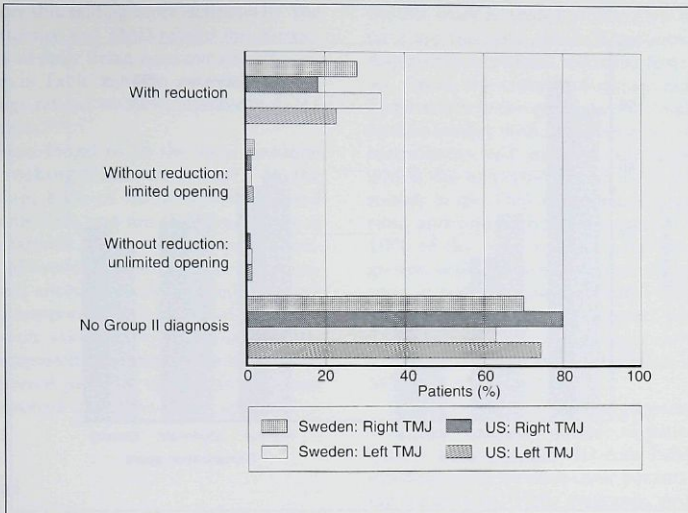
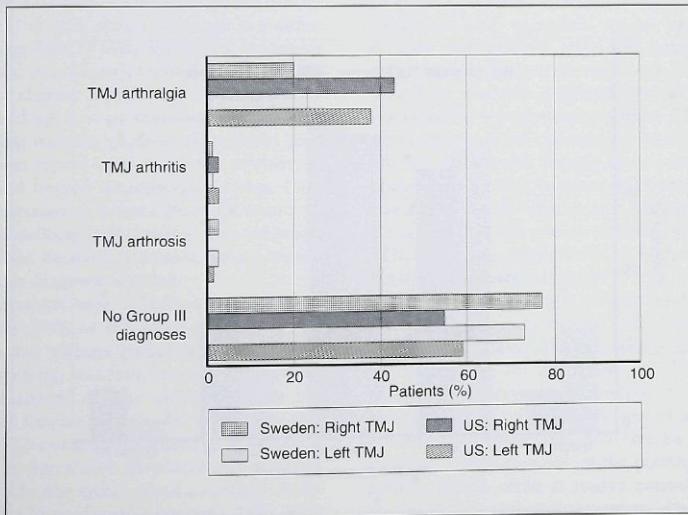Fig 3b Distribution of RDC/TMD Axis I diagnoses—Group II: disc displacements.

Fig 3c Distribution of RDC/TMD Axis I diagnoses—Group III: arthralgia, arthritis, arthrosis.
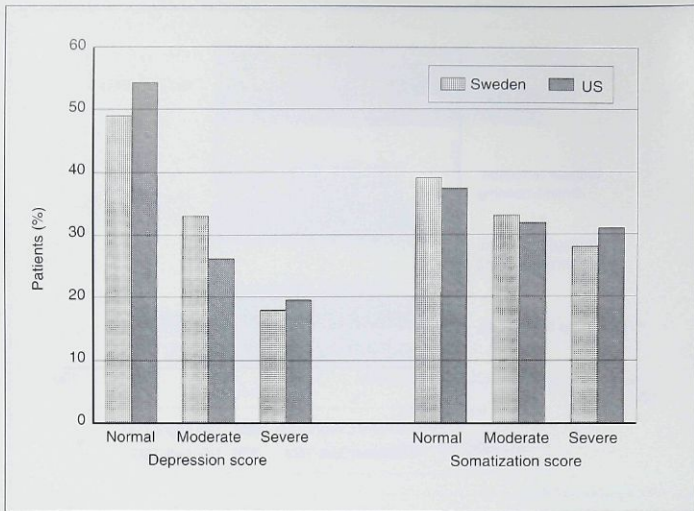
Fig 4 Distribution of normal, moderate, and severe scores for depression and somatization scale scores (SCL-90-R) in Swedish (n = 82) and US (n = 261) TMD clinic patients.
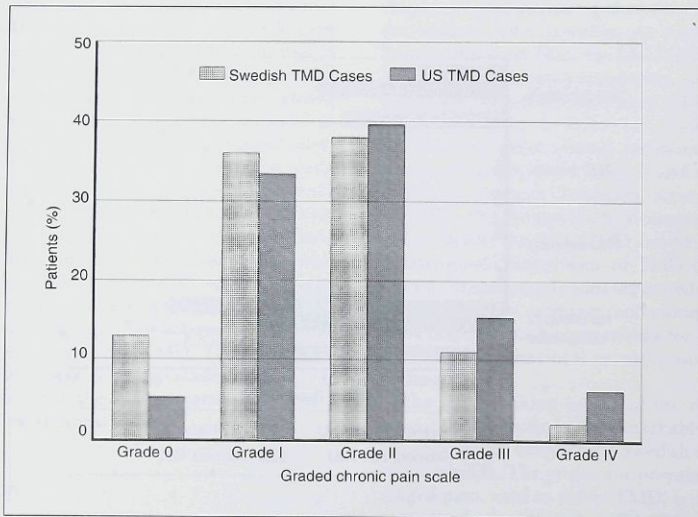

Fig 5 Distribution of chronic grade scores (0 to IV) in Swedish (n = 82) and US (n = 261) TMD clinic patients.

as yet to report this finding more definitively. The mean pain intensity and TMD-related interference with activities of daily living were remarkably similar, as shown in Table 1. Mean pain duration (as well as findings related to age) coincides with the findings of others.[4,26–29]

Pain has been found to be the most common reason for seeking TMD treatment.[4] In the Swedish group, 83% of the patients reported pain, but in only 73% was this the primary reason for seeking treatment. Other reasons were discomfort because of tiredness or stiffness in the masticatory muscles; clicking, catching, limited mouth opening, and temporary dislocation of the TMJ; and worry over severe attrition. Some of the patients who reported primarily tiredness and stiffness also reported pain. Of the US group, more than 90% reported pain when they appeared at the clinic.

Axis I Findings

The patterns of Axis I findings with regard to range of motion (see Fig 2) and distribution of RDC/TMD diagnoses (see Figs 3a to 3c) also showed marked similarities. Vertical range of motion was virtually identical in both clinics. The modal muscle disorder diagnosis was myofascial pain (see Fig 1) in both clinics, although in another US study using RDC/TMD, the modal diagnosis was myofascial pain disorder with limited opening reported at a slightly higher rate (approximately 58%).[30] The diagnosis of myofascial pain with limited opening includes presence of ambient pain complaint, pain report upon palpation of three or more sites, and limited mandibular opening. Care should be exercised to ensure that self-report of ambient pain reflects pain arising from muscles, not joints, when deciding if criteria for a Group I muscle disorder diagnosis are met.

Disc displacement with reduction was found in approximately 30% of the right and left joints; disc displacement without reduction, with or without limited opening, was found to occur at a much lower rate of around 5% for either joint (see Fig 3b). The latter frequency coincides with one investigation of 522 consecutive patients where 6% were found to have disc displacement without reduction.[16] On the other hand, another study found that of 170 consecutive patients, 36% were diagnosed as having disc displacement without reduction.[26] The differences are probably because of variations in the group as well as differences in diagnostic criteria; the former study used criteria more closely resembling the RDC/TMD criteria.

Further study is needed to determine if present criteria are too strict, excluding patients with disc displacements without reduction from the diagnosis. Again, the critical advantage that the RDC/TMD offers is the possibility of conducting such further studies with a common set of measuring instruments and methods. Osteoarthrosis, for which the examiner relied on coarse crepitus sounds in the TMJ as the major diagnostic criterion, and osteoarthritis were found in less than 10% of the right and left joints in both clinic groups, with a tendency for there to be even lower rates of arthrosis cases in the US clinic. It should be remembered that rates reported here for RDC/TMD diagnoses of joint disorders of all kinds do not include confirmation by joint imaging (eg, MRI or arthrograms).

It is to be expected that of consecutive patients at a TMD center, a number of patients will not qualify for an RDC/TMD Axis I diagnosis. For example, of the Swedish clinic patients not qualifying for an RDC/TMD diagnosis, two were diagnosed with temporary dislocations, one with neoplasm of the condyle, two with atypical facial pain, and one with burning mouth syndrome. All of these patients also exhibited TMD symptoms included in the RDC/TMD. In the RDC/TMD guidelines, specific criteria are not provided for conditions such as muscle spasm, myositis, contracture, polyarthritis, and acute traumatic injury, either because they occur with very low frequency (based on available epidemiologic data) or it was not possible for developers of the RDC/TMD to reach agreement on operational criteria that would reliably distinguish among these conditions that share many clinical features. It remains for future research to clarify whether it is more useful to continue to exclude these conditions from the RDC/TMD or, alternatively, to include them in a separate diagnostic category.

Several epidemiologic studies have found that TMD is common in children and adolescents.[31,32] The Swedish clinic observed a large proportion of the referrals in the age group of 15 to 20 years, which differs from other studies.[4,33–35] This high frequency might be a reflection of an increased awareness among the dentists to refer these patients; a high demand on the patients in this age group, which often is under considerable psychosocial pressure and stress; or, simply, the fact that dental treatment in Sweden is free for children and adolescents up to 19 years of age. There were no comparable data available from the US clinic with regard to younger patients, although such data are currently being gathered. Acceptable relia-

bility has been found in clinical examination of children and adolescents.[36] During the course of the present study, we also found that Axis I examination methods could be performed reliably on children and adolescents. However, because there are no Axis I epidemiologic or reliability data reported for such younger populations and because diagnostic cut-off points may vary depending on age, we decided not to include children and adolescents in the present analyses.

Axis II Findings

Axis II assessed oral parafunction and jaw disability, depression, presence of nonspecific physical symptoms, and level of psychosocial functioning measured as chronic pain grade.

The RDC/TMD contains a checklist to assess parafunction and jaw disability. However, little data are available on the reliability and validity of this component of the RDC/TMD. Two other scales have been published, and they relate mandibular function to usual daily activities.[9,37] Both scales have been found to be reliable and useful in assessing impairment in mandibular functioning[9,37,38]; however, the scale offered by Stegenga et al[9,38] has the advantage of including operational definitions for several dimensions of jaw function assessment. Future research may reveal the latter represents an improvement over the present RDC/TMD method for measuring jaw disability.

Chronic pain and depression as well as reports of nonspecific physical symptoms have been found to be strongly correlated.[39,40] The presence of multiple nonspecific physical symptoms typically associated with somatization (ie, tremors, heart palpitations, sweating) has been shown to influence the number of masticatory muscles reported as painful to diagnostic examination and to be associated with higher levels of depression.[41] In the present study, not only were Axis I findings essentially similar between the Swedish and US clinics, but Axis II findings were also very similar (see Figs 4 and 5). Thus, a significant minority in both groups met criteria of RDC/TMD for severe depression (approximately 20%) and severe levels of somatization (approximately 30%). It is critical to remember, however, that the normative values used to define these extreme categories were derived from a large US group, with demographic characteristics highly comparable to the US clinic group reported in the present study. By contrast, although a Swedish version of the SCL-90-R[42] has been used in clinical studies, no validity testing or population-based standardized scores have been reported.

Therefore, the findings with regard to the psychologic status of Swedish patients must be interpreted with caution, the remarkable similarity to the US clinic patients notwithstanding. As a clinical aside, the present study confirmed a practical advantage of systematic use of the SCL-90-R, in that it seems to facilitate identification of patients for cognitive-behavioral therapy or other forms of psychologically oriented referral.

The RDC/TMD also incorporates an easy-to-use seven-item scale that grades the patient with regard to current level of psychosocial functioning, as reflected through integration of pain intensity and pain interference scores. The grade of chronic pain has been shown to be related to amount of health care sought, depression, and use of medications.[24] Interestingly, there has not been any relationship reported between level of chronic pain grade and the most important physical (as opposed to psychologic or psychosocial) variables implicated in TMD, such as range of motion or number of joint sounds.[25] In the present study, there was a tendency for more US patients (approximately 21%, see Fig 5) to qualify as dysfunctional—defined as Grades III and IV—compared to the Swedish patients (approximately 14%). It was observed that 8% of Swedish patients were on sickness pension because of chronic pain, and 20% had been on sick leave 1 or more days during the last 6 months because of facial pain. Unfortunately, such specific data are not available for the US group.

Summary

The present study indicates that the RDC/TMD contains well-defined definitions useful for diagnosing the most common forms of TMD in two very different settings. It is important to observe that wherever reliable data can be assumed, as when age or gender is assessed, or when vertical range of jaw motion is measured, there seems to be good agreement across studies concerning distribution of patients along these variables. That is, TMD patients in virtually every clinical research report are found to be predominantly female and relatively young. Similarly, unassisted and assisted measures of jaw opening show remarkable consistency across many studies.

However, when measures associated with poor reliability and poor operational definitions for how to detect clinical findings are used, as is the case for detecting joint sounds and even whether specific masticatory muscles are tender to palpation,[43,44]

variability across studies increases markedly. It is not surprising, therefore, to find wide disagreement over how many cases of muscle disorder or disc displacement exist in different clinical settings, as we and others have shown. Assessing these more complex variables requires uniformity of definition and reliability of measurement. The initial results with the use of the RDC/TMD to assess widely separated and culturally diverse clinical populations reinforce the reasons the RDC/TMD was created in the first place—namely, to provide a working set of criteria and examination guidelines that would bring consistency to such important comparison studies.

Results from this study support the usefulness of the RDC/TMD for studying the most common forms of TMD by directly demonstrating some of the comparisons that can be made when divergent groups of TMD patients are assessed clinically using the same set of examination procedures, the same clinical diagnostic algorithms, and the same history methods to assess behavioral, psychologic, and psychosocial factors.

Acknowledgments

References

1. Greene CL, Marbach JJ. Epidemiologic studies of mandibular dysfunction: A critical view. J Prosthet Dent 1982; 48:184–190.
2. Helkimo M. Studies on function and dysfunction of the masticatory system: II. Index for anamnestic and clinical dysfunction and occlusal state. Swed Dent J 1974;67: 101–121.
3. Carlsson G, LeResche L. Epidemiology of temporomandibular disorders. In: Sessle B, Bryant P, Dionne R (eds). Progress in Pain Research and Management. Seattle: IASP Press, 1995:211–226.
4. Dworkin SF, Huggins KH, LeResche L, Von Korff M, Howard J, Truelove E, Sommers E. Epidemiology of signs and symptoms in temporomandibular disorders: Clinical signs in cases and controls. J Am Dent Assoc 1990;120: 273–281.
5. Burakoff RP, Kaplan AS. Temporomandibular disorders: Current concepts of epidemiology, classification, and treatment. J Pain Symptom Manage 1993;8:165–172.
6. Gerke DC, Goss AN, Pilowsky I. The relation of age to temporomandibular dysfunction. Clin J Pain 1988;4:17–26.
7. Oral Health Surveys—Basic Methods. Geneva: World Health Organization, 1971.
8. Rugh JD, Dahlstrom L. Psychological management of the orofacial pain patient. In: Stohler CF, Carlsson DS (eds). Biological and Psychological Aspects of Orofacial Pain. Ann Arbor, MI: University of Michigan Press, 1995:133–147.
9. Stetenga B, de Bont LGM, Boering G. Assessment of mandibular function impairment associated with temporomandibular joint osteoarthritis and internal derangement. J Orofacial Pain 1993;7:183–195.
10. American Academy of Craniomandibular Disorders. McNeill C (ed). Craniomandibular Disorders: Guidelines for Evaluation, Diagnosis, and Management. Chicago: Quintessence, 1990.
11. Fricton JR, Kroening RJ, Hathaway KM. TMJ and Craniofacial Pain: Diagnosis and Management. St Louis: Ishiyaku EuroAmerica, 1987.
12. Dworkin SF. Diagnosis and assessment: Behavioral characteristics (Axis II). In: Sessle BJ, Bryant PS, Dionne, RA (eds). Progress in Pain Research and Management. Seattle: IASP Press, 1995.
13. Merskey H (ed). Classification of chronic pain—Descriptions of chronic pain syndromes and definitions of pain terms. Pain 1986;(suppl 3):S1–S226.
14. Turk DC, Rudy TE. Toward an empirically derived taxonomy of chronic pain patients: Integration of psychological assessment data. J Consult Clin Psychol 1988;56(2):1–6.
15. Pullinger AG, Seligman DA. TMJ osteoarthrosis: A differentiation of diagnostic subgroups by symptom history and demographics. J Craniomandib Disord Facial Oral Pain 1987;1:251–256.
16. Lobbezoo-Scholte AM, DeLeeuw JRJ, Steenks MH, Bosman F, Buchner R, Olthoff LW. Diagnostic subgroups of craniomandibular disorders. Part I: Self-report data and clinical findings. J Orofacial Pain 1995;9:24–36.
17. Bell WE. Orofacial Pains: Classification, Diagnosis, Management, ed 3. Chicago: Year Book Medical, 1985.
18. Eversole LR, Machado L. Temporomandibular joint internal derangements and associated neuromuscular disorders. J Am Dent Assoc 1985;110:69–79.
19. Truelove EL, Sommers E, LeResche L, Dworkin SF, Von Korff M. Clinical diagnostic criteria for TMD: New classification permits multiple diagnoses. J Am Dent Assoc 1992;123:47–54.
20. Dworkin SF, LeResche L (eds). Research Diagnostic Criteria for Temporomandibular Disorders: Review, Criteria, Examinations, and Specifications, Critique. J Craniomandib Disord Facial Oral Pain 1992;6:301–355.
21. McCreary CP, Clark GT, Merril V, Oakley MA. Psychological distress and diagnostic subgroups of temporomandibular patients. Pain 1991;44:29–34.
22. LeResche L, Dworkin SF, Sommers E, Truelove EL. An epidemiologic evaluation of two diagnostic classification schemes for temporomandibular disorders. J Prosthet Dent 1991;65:131–138.
23. Derogatis LR. SCL-90-R: Administration, Scoring and Procedures Manual-II for the Revised Version. Towson, MD: Clinical Psychometric Research, 1983.
24. Von Korff M, Ormel J, Keefe FJ, Dworkin SF. Grading the severity of chronic pain. Pain 1992;50:133–149.
25. Dworkin SF. Personal and societal impact of orofacial pain. In: Fricton JR, Dubner RB (eds). Orofacial Pain and Temporomandibular Disorders. New York: Raven Press, 1995:15–32.

26. Isacsson G, Linde C, Isberg A. Subjective symptoms in patients with temporomandibular joint disc displacement versus patients with myogenic craniomandibular disorders. J Prosthet Dent 1989;61:70–77.

27. Bush FM, Harkins SW, Harrington WG, Price DD. Analysis of gender effects on pain perception and symptom presentation in temporomandibular pain. Pain 1993; 53:73–80.

28. List T, Helkimo M, Andersson S, Carlsson GE. Acupuncture and occlusal splint therapy in the treatment of craniomandibular disorders. Part I. A comparative study. Swed Dent J 1992;16:125–141.

29. Dworkin SF, LeResche L, Von Korff MR. Diagnostic studies of temporomandibular disorders: Challenges from an epidemiologic perspective. Anesth Prog 1990;37:147–154.

30. Zaki H, Rudy T, Turk D, Capirano M. Reliability of Axis I Research Diagnostic Criteria for TMD [abstract 676]. J Dent Res 1994;73(special issue):186.

31. Nydell A, Helkimo M, Koch G. Craniomandibular disorders in children—A critical review of the literature. Swed Dent J 1994;18:191–205.

32. Goodman JE, McGrath PJ. The epidemiology of pain in children and adolescents: A review. Pain 1991;46:247–264.

33. Wedel A. Heterogeneity of patients with craniomandibular disorders. A longitudinal study. Swed Dent J 1988;55 (suppl):1–51.

34. Clark GT, Lanham F, Flack VF. Treatment outcome results for consecutive TMJ clinic patients. J Craniomandib Disord Facial Oral Pain 1988;2:87–95.

35. Magnusson T. Patients referred for stomatognathic treatment—A survey of 282 patients. Swed Dent J 1984;21: 193–201.

36. Carlsson GE, Egermark-Eriksson I, Magnusson T. Intra- and inter-observer variation in functional examination of the masticatory system. Swed Dent J 1980;4:187–194.

37. List T, Helkimo M. A scale for measuring the activities of daily living (ADL) of patients with craniomandibular disorders. Swed Dent J 1995;19:33–40.

38. Stegenga B, de Bont LGM, Boering G. Temporomandibular joint pain assessment. J Orofacial Pain 1993; 7:23–37.

39. Duinkerke ASH, Luteijn F, Bouman TK, de Jong HP. Relations between TMJ pain dysfunction syndrome and some psychologic and biographic variables. Community Dent Oral Epidemiol 1985;13:185–189.

40. Dworkin SF, Massoth DL. Temporomandibular disorders and chronic pain: Disease or illness? J Prosthet Dent 1994;72:29–38.

41. Dworkin SF. Somatization, distress and chronic pain. Qual Life Res 1994;3:S77–S83.

42. Eriksson-Mangold M, Carlsson SG. Psychological and somatic distress in relation to perceived hearing disability, hearing handicap, and hearing measurements. J Psychosom Res 1991;35:729–740.

43. Dworkin SF, LeResche L, DeRouen T, Von Korff M. Assessing clinical signs of temporomandibular disorders: Reliability of clinical examiners. J Prosthet Dent 1990;63: 574–580.

44. Clark GT, Goulet JP, Flack VF, Liu C. Consistency at detecting TMJ clicking sounds [abstract 871]. J Dent Res 1990;69(special issue):217.

Resumen

Comparación de Diagnósticos y Hallazgos Clínicos Relacionados a la Articulación Temporomandibular en Centros Suecos y Estadounidenses Utilizando Normas de Diagnóstico en la Investigación de Desórdenes Temporomandibulares

Las normas de diagnóstico en la investigación de los desórdenes temporomandibulares (NDI/DTM) fueron desarrolladas originalmente en los Estados Unidos, luego fueron traducidas y utilizadas para clasificar los pacientes con DTM en cuanto al diagnóstico físico (Eje I), y su incapacidad relacionada al dolor y estado psicológico (Eje II) en una clínica especializada en DTM en Suecia. Los objetivos del estudio fueron los de determinar si tal proceso de translación traía como resultado una medida para investigación diagnóstica que fuera útil clínicamente y para reportar los hallazgos iniciales utilizando las (NDI/DTM) en comparaciones interculturales. Los hallazgos encontrados al utilizar la versión suiza de las (NDI/DTM) fueron comparados con los de una importante clínica estadounidense especializada en DTM, que produjo muchos de los datos clínicos utilizados para formular las (NDI/DTM) originales. Se registraron en el estudio cien pacientes consecutivos. Se excluyeron cinco pacientes con artritis reumatoidea y 13 niños o adolescentes. Los 82 pacientes remanentes que participaron en el estudio incluían a 64 mujeres y 18 hombres. Los desórdenes fueron clasificados en diferentes grupos. Grupo I: desorden muscular, el cual fue encontrado en el 76% de los pacientes; Grupo II: desorden de desplazamiento del disco, este fue encontrado en el 32% y 39% de los pacientes en sus articulaciones derecha e izquierda respectivamente; Grupo III: desórdenes de artralgia, artritis, y artrosis. Estos fueron encontrados en el 25% y 32% de los pacientes en las articulaciones derecha e izquierda respectivamente. La evaluación del estado psicológico (Eje II) demostró que el 18% de los pacientes generó registros de depresión severa y el 28%, registros altos de síntomas físicos no específicos. La disfunción psicosocial fue observada en el 13% de los pacientes basados en los registros escalonados de dolor crónico. Estos resultados iniciales indican que las guías de las NDI son valiosas para ayudar a clasificar los pacientes con DTM y permiten la comparación multicéntrica e intercultural de los hallazgos clínicos.

Zusammenfassung

Vergleich von MAP-Diagnosen und Befunden zwischen schwedischen und amerikanischen MAP-Zentren bei Benutzung von forschungsdiagnostischen Kriterien für Myoarthropathien

Die ursprünglich in den Vereinigten Staaten entwickelten "Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)" -Richtlinien wurden in einer auf Myoarthropathien (MAP) spezialisierten Klinik in Schweden übersetzt und verwendet, um MAP-Patienten zu klassifizieren betreffend: ärztlicher Diagnose (Axis I) und schmerzbezüglichen Einschränkungen, sowie dem psychologischen Status (Axis II). Mit der Studie sollte herausgefunden werden, ob die Übersetzung ein brauchbares diagnostisches Untersuchungsinstrument liefert und um anfängliche Befunde festzuhalten, wenn der RDC/TMD bei interkulturellen Vergleichen verwendet wird. Die mit der schwedischen Version des RDC/TMD erhaltenen Befunde wurden mit denen einer grossen amerikanischen MAP-Klinik verglichen. 100 aufeinanderfolgende Patienten wurden in die Studie eingeschlossen. Fünf Patienten mit rheumatischer Arthritis und 13 Kinder und Jugendliche wurden ausgeschlossen. Die verbleibenden 82 Patienten bestanden aus 64 Frauen und 18 Männern. Gruppe-I-Erkrankungen (Muskulatur) wurden bei 76% der Patienten gefunden; Gruppe-II-Erkrankungen (Diskusverlagerung) wurden bei 32% und 39% der Patienten im rechten, beziehungsweise im linken Gelenk gefunden; Gruppe-III-Erkrankungen (Arthralgie, Arthritis, Arthrose) wurden bei 25% und 32% der Patienten im rechten, beziehungsweise im linken Gelenk gefunden. Die Axis-II-Beurteilung des psychologischen Status zeigte 18% der Patienten mit hohen Werten für Depression und 28% mit hohen Werten für nichtspezifische physische Symptome. Psychosoziale Störungen wurden bei 13% der Patienten aufgrund von quantifizierten Angaben über chronischen Schmerz beobachtet. Diese anfänglichen Resultate scheinen zu zeigen, dass die RDC-Richtlinien bei der Klassifikation von MAP-Patienten nützlich sind und multizentrische und interkulturelle Vergleiche von klinischen Befunden erlauben.