Relationships Between Depression/Somatization and Self-reports of Pain and Disability

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Aims: *To examine the relationship between depression and somatization and pain during muscle and joint palpation as well as limitations related to mandibular functioning (LRMF) in patients with temporomandibular disorders.* ***Methods:*** *The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) data for Axes I and II for 196 consecutive patients (56 men and 140 women) with a history of facial pain were obtained. The mean age of the predominantly Chinese patient population (83.2%) was 33.4 years (range 18 to 55 years). A computerized diagnostic system was used to collect the RDC/TMD history data. The Symptom Check List (SCL-90) depression and somatization scales were generated on-line and archived. The mean muscle pain (MP), joint pain (JP), and LRMF scores were computed with depression and somatization as main effects. Data were subjected to analysis of variance (Scheffé test) and Pearson's correlation at a significance level of .05.* ***Results:*** *Depression scores ranged from 4.03 to 8.16 (MP), from 0.67 to 1.03 (JP), and from 0.30 to 0.38 (LRMF); somatization scores ranged from 2.64 to 7.75 (MP), from 0.58 to 1.00 (JP), and from 0.30 to 0.41 (LRMF). Interaction effects between depression and somatization were not significant. Patients with severe depression had significantly higher MP scores than normal patients or patients with moderate depression. Patients with moderate and severe somatization had significantly higher MP scores than normal patients. LRMF scores of patients with severe somatization were significantly greater than those who were normal or suffered from moderate somatization. No significant difference in JP scores was observed for depression and somatization scales. Correlations between depression/somatization and MP, JP, and LRMF scores were significant and positive but weak; coefficients ranged from 0.15 to 0.41.* ***Conclusion:*** *The results suggest that depression and somatization are related to the self-report of MP. In addition, severe somatization may be associated with an increase in jaw disability.* J OROFAC PAIN 2004;18:220–225

Key words: depression, pain, somatization, temporomandibular disorders

Temporomandibular disorders (TMD) are a collection of medical and dental conditions affecting the temporomandibular joint (TMJ), the masticatory muscles, and contiguous tissue components.[1] Although specific etiologies underlie some TMD, as a group these conditions have no common etiology or biological explanation. TMD are a heterogeneous group of health problems with signs and symptoms that overlap but are not necessarily identical.[1] The use of formal psychiatric diagnostic measures has shown that many individuals in clinical TMD populations meet the criteria for major depression and somatization.[2,3] Depression is the psychological mood characterized by feelings of

sadness, helplessness, hopelessness, guilt, despair, and futility while somatization is the pattern of multiple recurring physical complaints, resulting in medical treatment seeking, that are not explained by physical conditions.[4] Tender points, as part of fibromyalgia, have been found to be strongly associated with psychological distress as well as with characteristics of somatization and its antecedents.[5] A recent study also reported that subjects with depressed mood states had lower pain tolerance and higher pain catastrophizing scores compared to neutral subjects.[6]

However, some researchers have found no significant correlations between pain threshold and depression/somatization.[7,8] Patients with depression may even have higher pain thresholds than healthy control subjects.[8] Both depression and somatization may contribute to the development or maintenance of TMD and/or interfere with acceptance of and compliance with treatment.[9] In addition, depression/somatization may be associated with heightened self-report of jaw disability and pain as masticatory muscles or joints are palpated during the course of clinical examination,[10] thereby complicating TMD diagnosis and treatment outcome.

The use of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) provides researchers with a standardized system for gathering research and clinically relevant data.[11] Since their introduction in 1992, the RDC/TMD have been translated into various languages and widely used in clinical settings around the world where TMD and orofacial pain are managed.[3,12–14] The criteria mandate the use of clinical examination and history-gathering methods with scientifically demonstrated reliability for the assessment of clinical signs of TMD and also include psychological and psychosocial assessment. The RDC/TMD allow a physical diagnosis based on pathophysiology to be placed on 1 axis (Axis I) and behavioral, psychological, and psychosocial status on Axis II. The 2 main psychological parameters assessed in Axis II are depression and somatization. The RDC/TMD were used in the present study to determine the relationship between depression/somatization and *(1)* pain during muscle palpation, *(2)* pain during joint palpation, and *(3)* limitations related to mandibular functioning in patients with TMD. The authors hypothesized that depression and somatization relate to portions of the RDC/TMD Axis I clinical examination that require self-reporting of pain and to the portion of Axis II that requires self-reporting of jaw function disability history; specifically, that these psychological factors are associated with an enhancement of self-report of muscle pain (MP), joint pain (JP), and jaw disability.

Materials and Methods

The RDC/TMD are usually administered by pen and paper. The collected data are then entered manually and batch processed by a mainframe statistical package to obtain Axis I and II findings. With this method, a time lag between patient history taking and clinical examination and the generation of diagnoses is inevitable. A project to create an online computerized diagnostic tool based on the RDC/TMD was undertaken by the Faculty of Dentistry and the School of Computing of the National University of Singapore. This computerized diagnostic system (NUS TMD v 1.1) allows for direct data input by patients and clinicians, chairside generation of Axis I and II findings, and automatic archiving of data in SPSS for data-mining and global exchange.[15] The NUS TMD was used to collect RDC/TMD data on 196 consecutive patients (56 men and 140 women) with a history of facial pain.

The patients were referred to the TMD clinics at the National Dental Center and National University Hospital, which are the only institutionalized resources for diagnosis and management of TMD in Singapore, by general and specialist dental or medical practitioners in the community. The mean age of the predominantly Chinese patient population (83.2%) was 33.4 years (range 18 to 55 years). Patients with medically diagnosed polyarthritis and patients younger than age 18 years were excluded from the study. The latter group was excluded because several questions were thought to be difficult to understand or inappropriate for children and adolescents and because to date the RDC/TMD has been calibrated only in patients over 18 years of age. At the initial appointment, before undergoing treatment, patients used NUS TMD to answer the RDC/TMD history questionnaire. The questionnaire was modified for the Asian population; modifications involved only patient demographics (race, origin of ancestry, education, and household income) and did not affect RDC/TMD diagnostic algorithms. Psychological status was assessed with the depression and somatization scores measured with the subscales of the Symptom Check List (SCL-90).[15,16] The extent to which TMD interfere with mandibular function was assessed with a brief checklist of 12 items (chewing, drinking, exercising, eating hard foods, eating soft foods, smiling/laughing, sexual activity, cleaning teeth or face, yawning,

swallowing, talking, and having usual facial appearance). The score for limitations related to mandibular functioning was calculated by computing the number of positive responses and dividing this by the number of items answered.

After the electronic questionnaires were completed, clinical examinations were carried out by 2 RDC/TMD-trained and calibrated clinicians. The calibration exercise was conducted as part of an international collaborative oral health research planning project funded by the US National Institute of Dental and Craniofacial Research. Examinations were conducted according to specifications detailed in the RDC/TMD.[11] The RDC/ TMD clinical examination involves assessment of TMD signs and symptoms including pain site, mandibular range of motion and associated pain, TMJ sounds, and muscle and TMJ tenderness on palpation. Data on muscle and joint pain were used to determine interactions between depression/somatization and portions of the RDC/TMD Axis I clinical examination that require self-reporting of pain. Two pounds of digital pressure were applied to the temporalis and masseter muscles while 1 pound of digital pressure was applied to muscles in the posterior mandibular region (ie, to the stylohyoid and posterior digastric muscles) and the submandibular region (ie, to the medial pterygoid, suprahyoid, and anterior digastric muscles), as well as to the lateral poles and posterior attachments of the TMJs. Intraoral palpation sites (lateral pterygoid area, tendon of temporalis) were also tested with 1 pound of digital pressure. Digital palpation pressure was constantly checked and maintained via calibration against a postal scale or algometer (Kent Ridge Instruments). The potential range for number of muscles sites tender to palpation was 0 to 20 while that for number of joint sites tender to palpation was 0 to 4. Mean MP and JP scores were computed by tallying the pain intensities of all individual sites. Therefore, the maximum MP score was 60 (20 sites × maximum intensity of 3) and the maximum JP score was 12 (4 sites × maximum intensity of 3).

The number of painful palpation sites and MP, JP, and limitations related to mandibular functioning (LRMF) scores were computed with the depression and somatization scales as main effects. Normative data defining cutoff scores for normal, moderate, and severe levels of depression and somatization were provided by a large population-based study.[11] SPSS version 11.5 was used for statistical analysis at a significance level of .05. Differences in mean number of painful palpation sites and the various pain/disability scores between patients scoring normal, moderate, and severe on the depression and somatization scales were subjected to statistical analysis using 1-way ANOVA and Scheffé post hoc tests. Interaction effects between depression and somatization scales were analyzed by 2-way analysis of variance (ANOVA), with number of painful palpation sites and MP, JP, and LRMF scores as dependent variables. Pearson's correlation was applied to the MP, JP, and LRMF scores.

Results

The mean number of muscle and joint sites painful to palpation is shown in Table 1. The mean MP, JP, and LRMF scores for patients scoring normal, moderate, and severe on the depression and somatization scales are also given in Table 1.

Table 1 shows that severely depressed patients had a significantly greater number of painful muscle palpation sites than normal patients. In addition, they also had significantly greater MP scores than normal and moderately depressed patients. No significant differences in number of painful joint palpation sites or in JP or LRMF scores were observed between the 3 groups. Patients with moderate and severe somatization had significantly more painful muscle palpation sites and significantly higher MP scores than patients who did not have somatization. Although no significant difference in number of painful joint palpation sites or in JP scores were observed between the 3 groups, patients with severe somatization had significantly greater LRMF scores than patients with no or moderate somatization. Two-way ANOVA revealed no significant interaction between the depression and somatization scales in terms of the number of painful palpation sites and the various pain/disability scores.

A strong correlation was observed between depression and somatization scores ($r = 0.76$), as shown in Table 2. The correlations between MP and somatization and MP and JP were fair ($r = 0.41$ and $r = 0.52$, respectively) but the rest of the correlations (although statistically significant) were weak (0.18 to 0.29).

Discussion

TMD may be characterized as a chronic pain illness, as the term *illness* includes not only the physical disease process where discernible, but also the range of psychological and societal disturbances that accompany the perception of the physical disease.[17] Psychological factors have been implicated in several aspects of TMD.[18] First, stress-related

Table 1 Mean No. ± SE of Painful Palpation Sites and Pain/Disability Scores and Results of Statistical Analysis

	Depression scale				Somatization scale			
Variables	Normal (n = 108)	Moderate (n = 56)	Severe (n = 32)	*P*	Normal (n = 95)	Moderate (n = 45)	Severe (n = 56)	*P*
Painful muscle palpation sites	2.66 ± 0.29	3.04 ± 0.44	4.72 ± 0.66	.007	1.79 ± 0.21	3.82 ± 0.56	4.75 ± 0.49	≤ .001 ≤ .001
Painful joint palpation sites	0.44 ± 0.07	0.50 ± 0.11	0.69 ± 0.11	.31	0.38 ± 0.07	0.56 ± 0.16	0.64 ± 0.11	.14
MP score	4.03 ± 0.51	4.84 ± 0.73	8.16 ± 1.30	.037 .002	2.64 ± 0.35	6.27 ± 1.03	7.75 ± 0.93	.002 < .001
JP score	0.67 ± 0.12	0.77 ± 0.21	1.03 ± 0.29	.045	0.58 ± 0.12	0.82 ± 0.26	1.00 ± 0.20	.20
LRMF score	0.30 ± 0.02	0.38 ± 0.03	0.37 ± 0.04	.06	0.30 + 0.02	0.30 ± 0.03	0.41 ± 0.03	.021 .006

Bars denote significant differences between groups.

muscle hyperactivity and oral habits have been suggested as etiologic factors. Second, psychological factors have been suggested to explain why some patients seem to be more troubled by some symptoms and why only a small percentage of patients actually seek treatment. Finally, psychological conditions have been used to explain why some patients do not respond to conventional therapy. In a recent study, the prevalence of depression and somatization in Asian, American, and Swedish TMD cohorts was compared.[3] Despite differences in culture, ethnicity, and health care provision, Axis II findings for depression and somatization were very similar between the 3 TMD cohorts. When data were pooled in this study, approximately 40% to 50% of TMD patients were depressed and 50% to 60% experienced moderate to severe somatization. The prevalences of depression (44.9%) and somatization (51.8%) of the current facial pain cohort (Table 1) were within these ranges.

Patients who suffer from depressive disorders typically present with a constellation of psychological, behavioral, and physical symptoms, including headaches, muscle tension, pains, and aches.[19] TMD-related pain may therefore be the somatic expression of depression in some TMD patients. If this is true, the presence of TMD in these patients can be generalized to a "class of negative physical symptoms that are not associated with any progressive or measurable pathophysiology."[17] Depression may also alter patients' perception of and tolerance for pain, causing them to seek more care.[20,21] This was corroborated by the present study, where severely depressed TMD patients were found to have a significantly greater number of painful muscle palpation sites and MP scores than normal patients. A

Table 2 Results of Pearson's Correlation

	Somatization	MP	JP	LRMF
Depression	0.76	0.29	0.15	0.20
Somatization		0.41	0.15	0.26
MP			0.52	0.19
JP				0.18

All correlations shown were significant at the .05 level (2-tailed Scheffé test).

significant correlation between depression score and MP score was also observed. It is therefore probable that a relationship exists between depression and the self-report of pain. The exact biological mechanism by which depression is translated into the sensation of or decreased tolerance to pain, or pain into depression, is not known. A possible explanation may be found in the shared underlying neurochemical mechanisms of depression and pain involving the diathesis-stress framework and the hypothalamic-pituitary-adrenal (HPA) axis.[22–24] Melzack has postulated the existence of a pain neuromatrix in which the experience of pain is produced by multiple influences and comprises a widely distributed neural network with input from the body's stress-regulation systems, including the HPA and opioid systems.[25] Hyperactivity of the HPA system and hypercortisolemia have been reported in patients with depression and facial pain.[24,26] Antidepressants have the ability to modulate HPA axis activity and increase glucocorticoid receptors.[27] Their successful use in the management of chronic facial pain regardless of comorbid depressive disorders lends some support to Melzack's hypothesis.[28,29]

The relationship between somatization scales and number of painful muscle palpation sites has been reported for American TMD cohorts.[10] In that

study, the mean number of painful muscle sites ranged from 3.4 to 5.7, from 5.9 to 8.3, and from 8.6 to 12.1 for patients scoring normal, moderate, and severe, respectively, on the SCL-90 scale. Although the mean number of painful muscle palpation sites for the current Asian TMD cohort was lower, a similar trend was observed between the 2 cohorts. In the American cohort, the mean number of painful muscle palpation sites was greater for patients with severe somatization than for normal patients. For the current TMD cohort, the mean number of painful muscle sites (with no overlap in distribution) was 1.8 for those in the normal range versus 4.8 for those in the severe range of the somatization scale. Patients with moderate and severe somatization had a significantly greater number of painful muscle palpation sites and significantly higher MP scores than normal patients. This finding, in addition to the significant and relatively strong correlation between MP score and somatization score, suggests that somatization might be associated with a heightened self-report of pain, as numerous masticatory muscles are palpated during the course of an Axis I diagnostic clinical examination. A strong association between low (< 0.50), moderate (0.50 to 0.99), and high somatization scores (≥ 1.00) and number of defined placebo sites reported as painful during an RDC/TMD Axis I standardized clinical examination has also been reported; 45% of those scoring high on somatization reported 1 or more placebo sites on the face and head painful to palpation, compared to only 15% of those scoring low on somatization.[30]

No significant differences were observed in number of painful joint palpation sites or in JP scores. The correlation between depression/somatization and JP scores (although statistically significant) was weak. This may be attributed in part to the restricted range of scores and to the sample size. Laskin has distinguished myofascial pain, which is of muscular origin and more diffuse in nature, from TMJ pathologies.[31] If pain is present in the latter condition, it is usually more localized. This division is widely used when psychological profiles are evaluated between different subgroups of TMD patients. Several studies have found that patients with myofascial pain have greater depression than patients with TMJ pathologies.[3,32,33] The lower frequency of psychological distress in patients with TMJ pathologies and pain may explain the lack of statistical difference between patients who scored normal, moderate, and severe in terms of the number of painful joint sites and JP scores in the current study. The low incidences of TMJ arthralgia and osteoarthritis in the Asian TMD population[3] and the small number of joint palpation sites could also be contributory factors.

In the current study, the LRMF scores of patients with severe somatization were significantly greater than those who were normal or experienced moderate somatization. Five out of the 12 items in the self-report LRMF inventory were pain-related and 7 were non-pain-related symptoms. As the 3 most frequent jaw disabilities associated with TMD (eating hard foods, yawning, and chewing) were all pain-related,[34] the significant influence of somatization on jaw disabilities is not unexpected in view of the association between multiple pains and somatization.[35,36]

The results of the present study suggest that depression and somatization are related to the portions of the RDC/TMD Axis I clinical examination that require self-reporting of pain and the portion of Axis II that require self-reporting of jaw function disability history. More specifically, depression and somatization may be associated with an enhancement of the self-report of muscle pain during palpation. In addition, severe somatization can be related to an increase in jaw disability. Although interaction effects were not significant, the similarity in findings and strong correlation between depression and somatization reflect a possible shared pain-related variance between the 2 factors that warrants further investigation. These psychological factors may be a predictor of poor TMD outcome.[37] For patients who manifest appreciable psychological distress, biomedical therapies aimed at alleviation of physical symptoms alone may be limited and may perpetuate an unsatisfying search for dental, medical, surgical, and other types of symptom management. Turk et al[38] have recommended the use of a cognitive behavioral approach to the education and treatment of TMD patients, and Dworkin et al have demonstrated the effectiveness of such an approach.[39,40] This approach offers the dual benefit of teaching patients how to self-manage their symptoms while enhancing the feeling of empowerment that comes from such skills. The findings of the present study also confirmed the clinical utility of RDC/TMD Axis II for screening for potential overreporting of positive responses to an RDC Axis I clinical examination for painful masticatory muscle sites, and for screening for reports of pain as a non-TMD-specific physical symptom, as proposed by Dworkin et al.[10]

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