Jaw Pain: Its Prevalence and Meaning in Patients with Rheumatoid Arthritis, Osteoarthritis, and Fibromyalgia

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ABSTRACT. ***Objective***. Jaw pain may occur in rheumatoid arthritis (RA), osteoarthritis (OA), and fibromyalgia (FM). We investigated the prevalence and correlates of jaw pain, and whether jaw pain is increased in RA, where intrinsic articular disease can be noted radiographically, or is a manifestation of a generalized pain problem.

Methods. We analyzed data from 22,720 patients participating in a longitudinal outcome study of rheumatic diseases, including 17,683 with RA, 4,011 with OA, and 1,026 with FM. Jaw pain was considered to be present if a patient indicated it in either the left or right jaw. In addition to standard rheumatic disease measures, we also obtained self-report assessments that included a count of painful nonarticular regions (the regional pain score, RPS), a joint count, and a count of symptoms.

Results. The age and sex adjusted rate of jaw pain was 18.7% in RA, 18.6% in OA, and 35.4% in FM. Jaw pain was best predicted by joint count, RPS, and a count of somatic symptoms in univariate analyses. In multivariate analyses jaw pain was predicted by joint count, RPS, symptom count, and fatigue. The ROC area under the curve for this model was 0.79, and 82.8% of patients were correctly classified. There was little difference in predictor variables for RA and OA patients. Covariate adjusted analyses controlling for age, sex, symptom count, fatigue, RPS, and joint count predicted jaw pain in 14.7% (95% CI 14.1 to 15.3) of RA and 11.6% (95% CI 10.6 to 12.7) of OA patients. This difference, 3.1%, may represent the increment in jaw pain attributable to RA.

Conclusion. Jaw pain is present in about 19% of patients with RA and OA, and is primarily a marker for a general pain increase and symptom sensitivity problem. Patients who have jaw pain have worse outcomes manifested by decreased functional ability, lower household income, and decreased quality of life. Variables not usually formally measured in clinical practice best identify this problem: self-reported joint count, symptom count, count of painful regions (RPS), and a visual analog scale for fatigue. (J Rheumatol 2005;32:2421–8)

Key Indexing Terms:
JAW PAIN | TEMPOROMANDIBULAR JOINT DISORDERS
SELF-REPORT | REGIONAL PAIN SCALE | SYMPTOM COUNT

Symptoms relating to temporomandibular disorders (TMD) are relatively common in epidemiological studies, with rates ranging from 16% to 59%, depending on the definition of TMD and the symptoms studied[1]. In a well done epidemiological study more relevant to jaw pain than TMD, Von Korff, *et al* reported that 12% of an age stratified sample from a Seattle Health Maintenance Organization (HMO) had pain in the region of the jaw in the last 6 months[2]. Lipton, *et al* studied facial pains in a sample of 42,000 households and reported that 6% of the population over the age of 18 years had face or jaw pain[3]. Rates were twice as high in women as in men and decreased with age.

There have been no large studies of the prevalence of TMD in rheumatoid arthritis (RA). Most studies of RA have been small and have reported on joint erosions, relationship to disease activity, or on specific joint related findings[4-10]. Pincus, *et al*, however, noted the prevalence of joint tenderness, swelling, and deformity in RA joints in a study of 189 RA patients[11]. Joint tenderness was noted in 17% of left and 17% of right temporomandibular (TM) joints. Swelling was noted in 3% and 4% of the joints, respectively. Only the sternoclavicular joint was less frequently involved. Despite the 17% finding, neither the authors nor Theodore Pincus (personal communication)[11] can recall more than a single case of persistent, severe TM joint involvement in our clinical practices over 25 years. Clinically important TM joint disease seems, therefore, to be relatively uncommon in RA.

Fibromyalgia (FM) is clearly associated with temporomandibular region symptoms[12-15], reminding us that jaw pain may occur in persons without joint abnormality, and joint abnormality may occur in patients without pain. Jaw

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Accepted for publication June 15, 2005.

pain is also influenced by psychosocial characteristics[13,16–22]. With this as a background we undertook to estimate the prevalence of jaw pain in patients with RA, OA, and FM and to characterize its meaning, predictors, and correlates.

The nomenclature of jaw related disorders is complex and arcane. Overlapping terminology can address regions of involvement, joint diseases, or a series of problems and syndromes that are defined separately under the rubric of TMD. Jaw pain can be a part of each of these definitions. In this report we are describing self-reported jaw pain, although that usage is also germane to the general "temporomandibular disorders" (TMD) and the more specific "temporomandibular joint disorder" (TMJD).

MATERIALS AND METHODS

Patient sample. Patients in this study were participants in the National Data Bank for Rheumatic Diseases (NDB) longitudinal study of rheumatic disease outcomes. Patients are recruited from the practices of United States rheumatologists[23-25], and are followed with semiannual questionnaires. This report concerns 22,720 patients who participated in the NDB research between 1998 and 2004, including 17,683 with RA, 4,011 with OA, and 1,026 with FM. For patients who completed more than one questionnaire, a single questionnaire was randomly selected for analysis.

Demographic and disease status variables. NDB participants complete detailed 28-page questionnaires about all aspects of their illness. At each assessment, demographic variables recorded include sex, age, ethnic origin, education level, current marital status, and medical history. Measures used in this report included the Stanford Health Assessment Questionnaire functional disability index (HAQ)[26]. Visual analog scales (VAS) included those for gastrointestinal (GI) problems, fatigue, pain, global severity, and quality of life (as a 0–100 "feeling thermometer")[27]. Anxiety and depression were assessed using the Arthritis Impact Measurement Scales[28,29]. Utilities are mapped from HAQ disability index values based on a regression model derived from simultaneous administration of EuroQol[30-32], HAQ, and Medical Outcome Study Short Form-36 (SF-36) pain and mood scales to 565 RA patients[33]. A self-report joint count was obtained using the RA Disease Activity Index[34]. The Regional Pain Scale (RPS) is a self-report count of nonarticular regions[35,36]. Because "jaw pain" is often thought to be nonarticular, it is also included in this index. However, we removed jaw pain from the RPS in the analyses in this study to avoid confounding by measure duplication. Jaw pain was considered to be present if the patient reported pain in either the left or right jaw region. Patients also report rheumatic and nonrheumatic disease symptoms that were present within the last 6 months. A summated count of 36 symptoms constituted the symptom count of this study. The lifetime comorbidity score is the sum of present or past comorbid conditions reported by the patient. Conditions include cancer, stroke, fracture, and renal, endocrine, GI, cardiovascular and hepatobiliary problems. The lifetime comorbidity index has been found to correlate well with mortality[37].

Statistical analyses. Kendall's tau a and associated confidence limits were calculated using the Somers-D package[38]. Descriptive statistics and other analyses were performed using Stata version 8.2[39].

RESULTS

As expected, the rate for jaw pain and bilaterality of jaw pain was greatest in persons with FM (Table 1). The crude rate of jaw pain was slightly greater in RA than OA, but after adjustment for age and sex, there was no significant difference between RA and OA patients in respect to jaw pain. Of interest, when the survey criteria for FM were applied to RA and OA patients, the adjusted rate of jaw pain was 42.1%.

Table 1. Rates and bilaterality of jaw pain in patients with RA, OA, and FM.

Diagnosis	Jaw Pain, Crude Rate per 100 Patients (95% CI)	Jaw Pain, Age and Sex Adjusted Rate per 100 Patients (95% CI)	Bilaterality, %
RA	19.4 (18.8, 20.0)	18.7 (18.1, 19.3)	65.2
OA	17.8 (16.6, 19.0)	18.6 (17.4, 19.9)	67.9
FM	41.2 (38.2, 44.2)	35.4 (32.6, 38.4)	78.3
FM in RA or OA*	43.7 (42.3, 45.2)	42.1 (40.7, 43.6)	75.2

* Diagnosed in RA and OA patients by application of survey FM criteria.

To further characterize jaw pain, we next excluded patients with FM (except as indicated below) because of the high jaw pain rate in this group and the difficulty in drawing inferences concerning jaw pain generally with FM patients included.

We then examined a series of key RA and OA variables in relation to jaw pain. As expected, jaw pain was more common in women (22.6% vs 13.7%; $p < 0.001$). Jaw pain rose to its peak level in the 20–30 year age group, and then fell progressively through age 90 (Figure 1).

As shown in Figure 2, jaw pain was strongly related to the number of nonarticular painful areas, with mean (SD) values of 9.8 (5.2) for persons with jaw pain compared with 5.1 (4.4) for those without jaw pain. Jaw pain (+) and jaw pain (–) patients had the following respective values: fatigue 6.1 (2.7) versus 4.2 (2.9) (Figure 3), symptom count 12.2 (7.0) versus 6.9 (5.4) (Figure 4), mapped EuroQol 0.46 (0.25) versus 0.63 (0.22) (Figure 5).

We examined the relationship between jaw pain and a series of key variables using Kendall's tau a (Table 2). Tau a has a simple interpretation, the percentage agreement between jaw pain (+) and jaw pain (–) patients for the clinical variable. For example, a value of 0.15 in Table 2 for regional pain scale (RPS) means that it is 15% more likely that a person with jaw pain will have an elevated RPS than a person without jaw pain. The tau a values and their 95% CI also allow us to understand which factors are most strongly associated with jaw pain. In Table 2 these factors are RPS, self-reported joint count, and symptom count. Variables that are of comparatively less importance include anxiety, depression, GI severity scale, VAS quality of life, and comorbidity.

Table 3 shows a parsimonious model of jaw pain for RA and OA patients, retaining those variables in the model that were statistically significant at < 0.05. For ease of interpretation Table 3 includes exponentiated standardized regression coefficients (or standardized odds ratios). The symptom

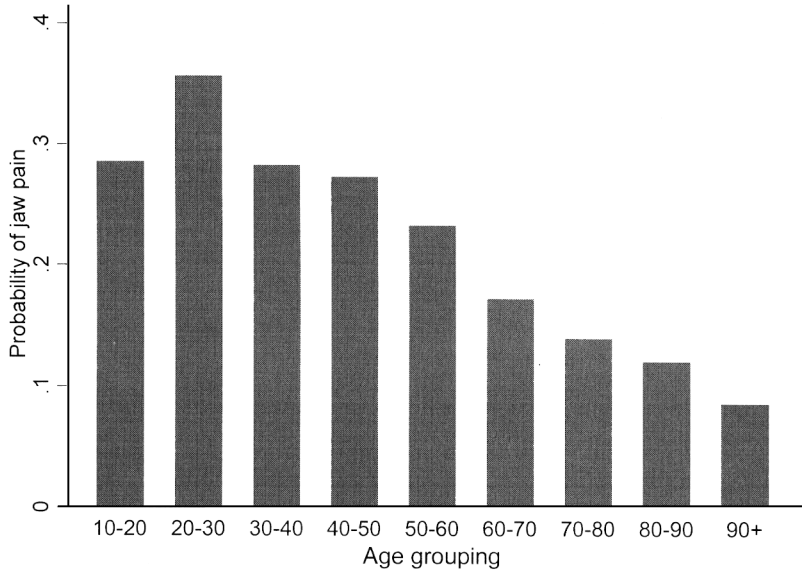

Figure 1. The relationship between age and jaw pain in patients with RA and OA.

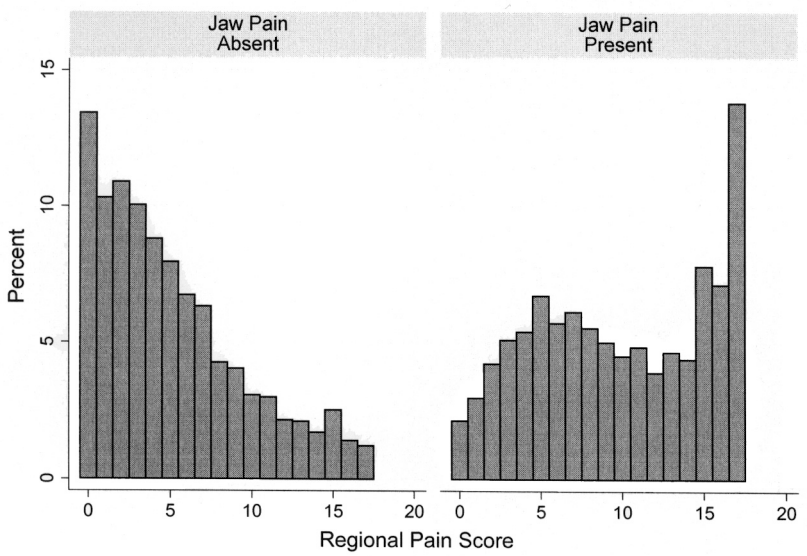

Figure 2. Histogram of regional pain scores in patients with and without jaw pain. Fibromyalgia patients are excluded from this analysis.

count is the most important predictor of jaw pain, followed by the joint count and RPS. Fatigue is a less important predictor. In contrast to the adjusted result for Table 1, in which RA and OA patients did not differ as to the presence of jaw pain, the addition of the covariates of Table 3 shows that the risk of jaw pain is increased in RA in this model. The adjusted probability of jaw pain, holding age, sex, and the covariates of Table 3 at their means, is 14.7% (95% CI 14.1 to 15.3) for RA and 11.6% (95% CI 10.6 to 12.7) for OA. The area under the receiver operator characteristic curve for this model is 0.79, and 82.8% of patients are correctly classified.

Patient self-report joint counts were similar among RA [7.7 (SD 4.6)] and OA patients [7.4 (SD 4.5)] (Figure 6), although the difference was statistically significant owing to the large sample size. FM patients reported even more joints as painful, 9.6 (SD 4.7). The overall correlation between the RPS and joint count score was 0.79 (all diagnostic groups included). Table 4 indicates that the relationship between RPS and joint pain is consistent across the 3 diagnostic groups.

DISCUSSION

Our study raises a number of issues. It is clear that what physicians mean by a tender joint is quite different from what patients report as a painful joint; otherwise patients with OA would have many fewer painful joints than those

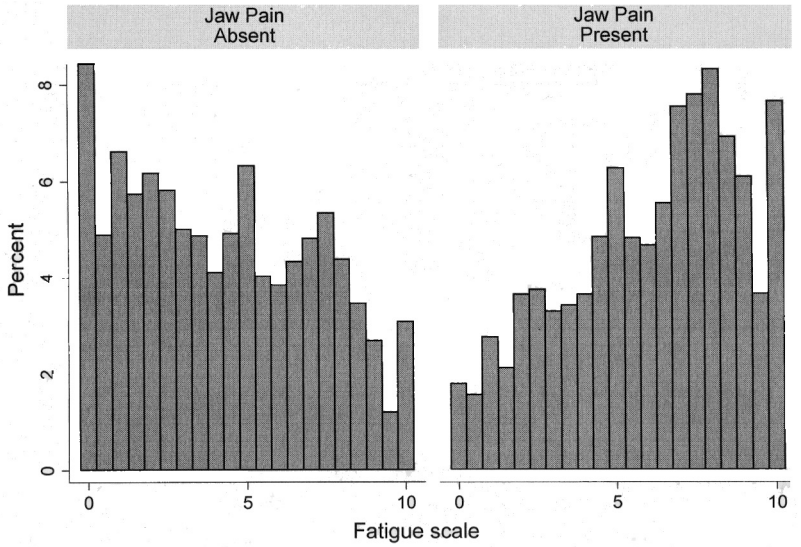

Figure 3. Histogram of fatigue scores in patients with and without jaw pain. Fibromyalgia patients are excluded from this analysis.

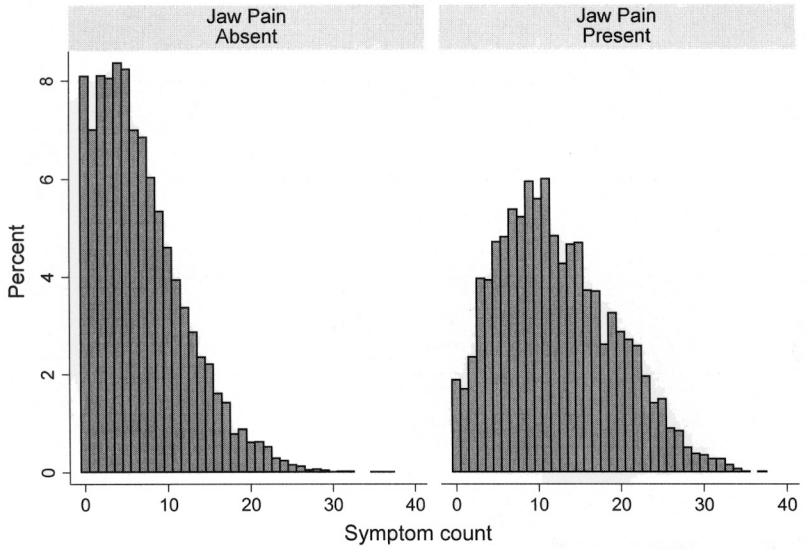

Figure 4. Histogram of symptom count in patients with and without jaw pain. Fibromyalgia patients are excluded from this analysis.

with RA. During clinical joint examinations the rheumatologist authors of this article often hear patients say, "It doesn't hurt when you do it [moving the patient's joints] but it hurts when I move it." This is one explanation for the increase in joint pain and the similar levels of joint pain in RA and OA reported by patients in this study (Figure 6).

In many of the results of this study, including the one just discussed, we have omitted patients with FM. We did this because some, including us, consider patients with FM to differ by being at the end of a spectrum of pain and distress. That is, they are preselected for the characteristics under study; and to get at those characteristics more generally, FM patients needed to be excluded. However, in data not shown, the relationships between the study clinical variables do not differ appreciably by virtue of diagnosis.

We also found that the amount of nonarticular pain reported by patients was similar among RA and OA patients as measured by the nonarticular RPS. This pain is an important part of the illness of RA and OA patients, contributes significantly to the reduction in quality of life, interferes with standardized measurements, and is almost universally ignored in clinical trials of RA and OA. Clinical trial results could be further illuminated if this measure were included in these studies.

Jaw pain is usually seen from several perspectives. It may be the result of primary or secondary OA. It may also

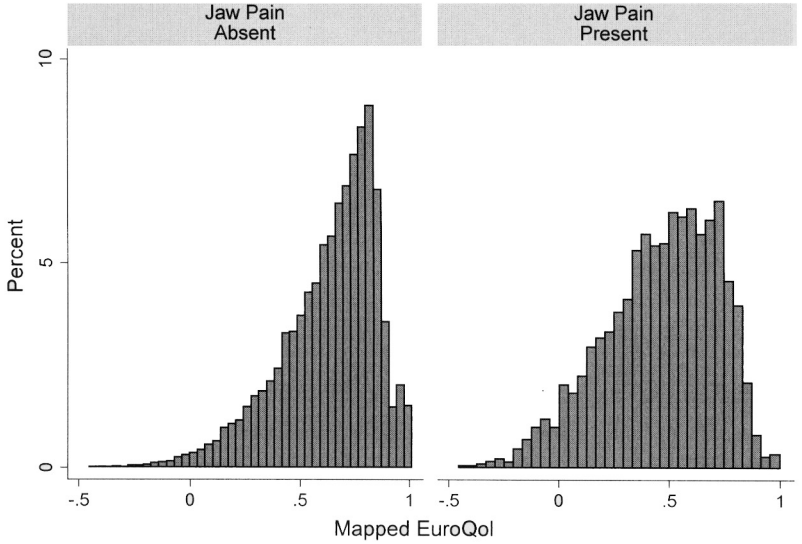

Figure 5. Histogram of EuroQol utilities in patients with and without jaw pain. Fibromyalgia patients are excluded from this analysis.

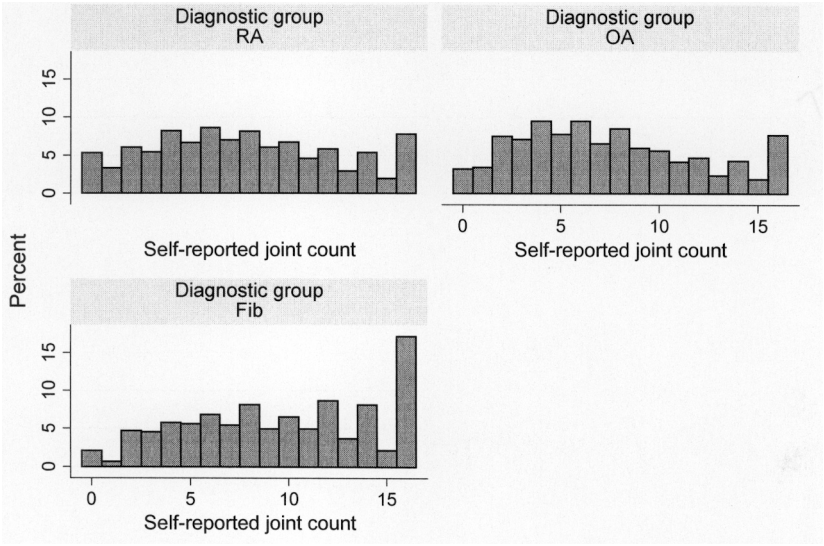

Figure 6. Self-reported joint counts in patients with RA, OA, and fibromyalgia.

be a manifestation of a muscle pain disorder and/or may be a manifestation of a generalized pain disorder, such as FM. Finally, it may be the result of joint inflammation caused by RA. One problem with the literature of jaw pain is that it is often contributed to by specialists who may not always be fully cognizant of the manifestations of illnesses such as RA. The literature of RA and TMJD stresses the relationship between inflammation and TMJD. Although rheumatologists see and treat RA of the TMJ, clinically obvious TMJD is uncommon, and clinical trials find the TMJ to be involved infrequently.

The results of our study show that jaw pain is a part of a general pain disorder, rather than being a specific disorder of the TMJ. This conclusion is suggested by the failure to find an increase in jaw pain in RA patients compared to those with OA, a general increase in jaw pain in younger rather than older persons, and the association of jaw pain with a wide variety of pain, fatigue and distress related variables.

Table 2 shows the variables most related to jaw pain. Table 3 shows this even more dramatically, as most of the variables of Table 2 drop out of this model. One of the most important predictors of jaw pain is the symptom count (Figure 4). Although the symptom count increases with RA activity and with comorbidity, it is a measure of somatic sensitivity and does not differ appreciably in its level in RA compared with OA patients; therefore, it cannot be consid-

Table 2. Kendall's tau a for agreement between persons with and without jaw pain for key clinical variables. Fibromyalgia patients are excluded from this analysis.

Variable	Kendall's Tau a	Z Score	p	95% CI
Joint count	0.15	50.66	< 0.001	0.30, 0.32
Regional pain scale	0.15	49.97	< 0.001	0.15, 0.16
Symptom count	0.14	43.98	< 0.001	0.13, 0.15
Mapped EuroQol	–0.12	–38.46	< 0.001	–0.13, –0.12
VAS pain	0.11	36.54	< 0.001	0.10, 0.11
VAS fatigue	0.11	36.32	< 0.001	0.10, 0.11
HAQ disability	0.10	34.42	< 0.001	0.10, 0.11
VAS patient global	0.10	32.12	< 0.001	0.09, 0.10
Anxiety	0.09	30.74	< 0.001	0.09, 0.10
Depression	0.09	29.38	< 0.001	0.08, 0.10
VAS GI scale	0.09	30.28	< 0.001	0.09, 0.10
VAS QOL	–0.08	–25.20	< 0.001	–0.09, –0.08
Lifetime comorbidity	0.06	19.75	< 0.001	0.06, 0.07

VAS: visual analog scale, HAQ: Health Assessment Questionnaire, GI: gastrointestinal, QOL: quality of life.

Table 3. Multivariate regression analysis of jaw pain. Fibromyalgia patients are excluded from this analysis. Standardized odds ratio is the change in odds ratio for a unit standard deviation change in the predictor variable.

Variable	Odds Ratio	Standardized Odds Ratio	Z Score	p
Symptom count (0–37)	1.07	1.52	17.84	0.000
Joint count (0–16)	1.10	1.56	13.63	0.000
Regional pain scale (0–19)	1.07	1.38	10.13	0.000
Fatigue scale (0–10)	1.04	1.12	4.66	0.000
RA	1.41	1.13	6.51	0.000

ered to be a measure of RA activity. The 2 pain variables, RPS and joint count, are also important in predicting jaw pain. When combined (data not shown), their overall predictive strength for jaw pain exceeds the symptom count slightly. In addition, Table 4 indicates that the balance between RPS and joint count is essentially similar across the 3 diagnostic groups. These data suggest that jaw pain is part of a general pain increase and symptom sensitivity problem, perhaps mediated through neurotransmitter effects[40,41]. The generalized pain symptom distress problem has been described by a number of authors; however, we add quantitative data in support of this viewpoint.

Although we have discussed jaw pain as a function of generalized pain and/or local joint damage, there is a third mechanism, referred pain from the cervical spine, as shown by Smythe[42]. Because our current data, unlike those of Smythe and our previous study[43], did not include physical examination data, we were unable to accurately measure this effect, and omitted it from analyses. We note, however, that neck pain is included in the RPS score and may contribute to a referred pain effect.

The figures and tables of this study also describe a continuum of pain, symptoms, and distress that is present in all patients. It is not necessary to consider whether a patient does or does not have FM to understand the relationship of these factors. If jaw pain is a marker of a general pain increase and symptom sensitivity problem, as we have suggested, one might ask of what importance it is to the understanding and treatment of rheumatic disease. For the rough-

Table 4. Kendall's Tau a for agreement between persons with and without jaw pain for regional pain scale and self-reported joint count according to diagnostic category.

Variable	Kendall's Tau a	Z Score	p	95% CI
RA				
Joint count	0.15	45.65	0.000	0.15, 0.16
Regional pain scale	0.15	44.84	0.000	0.15, 0.16
Difference	0.00	–0.27	0.786	0.00, 0.00
OA				
Joint count	0.15	21.73	0.000	0.14, 0.17
Regional pain scale	0.17	23.84	0.000	0.15, 0.18
Difference	–0.01	–3.64	0.000	–0.02, –0.01
FM				
Joint count	0.19	11.75	0.000	0.16, 0.22
Regional pain scale	0.21	13.07	0.000	0.18, 0.24
Difference	–0.02	–1.72	0.086	–0.04, 0.00

ly 19% of RA and OA patients who report this symptom, the HAQ score is increased by 0.43 (95% CI 0.41 to 0.46), quality of life, using the mapped EuroQol utility score, is reduced by 0.17 (95% CI 0.16 to 0.18), and total income (2001 dollars) is reduced by $US 1019 (95% CI 840 to 1199), after adjustment for age and sex. These differences in HAQ score and EuroQol are greater than what are seen in clinical trials of anti-tumor necrosis factor agents. It should be clear that we are not suggesting that jaw pain causes these differences; instead, we see it as marker for the general pain increase and symptom sensitivity problem. It is not necessary to posit FM to identify patients with this problem. However, the findings of this report are supported in patients who have been diagnosed with FM.

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