Annals of the Rheumatic Diseases 1996; **55**: 482–485

More pain, more tender points: is fibromyalgia just one end of a continuous spectrum?

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Abstract

***Objectives*—To investigate the hypothesis that fibromyalgia represents one end of a spectrum in which there is a more general association between musculoskeletal pain and tender points.**

***Methods*—The subjects studied were 177 individuals selected from a population based screening survey for musculoskeletal pain. All subjects completed a pain mannikin and were examined for the presence of tender points at the nine American College of Rheumatology bilateral sites.**

***Results*—There were moderately strong associations (odds ratios range 1·3–3·1) between the reported presence of pain in a body segment and the presence of a tender point within that segment. Further, there was evidence of a trend of increasing number of tender points with increasing number of painful segments. The reporting of non-specific pain, aching, or stiffness, was also associated with high tender point counts.**

***Conclusion*—This study illustrates that the association between tender points and pain is not restricted to the clinically defined subgroup with chronic widespread pain. Given that widespread pain and tender points have previously been linked with distress, this might reflect lesser degrees or earlier phases of the somatisation of distress.**

(*Ann Rheum Dis* 1996; **55**: 482–485)

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Accepted for publication 7 March 1996

Fibromyalgia is the term applied to a syndrome of widespread musculoskeletal pain and multiple tender points which, in patients attending specialist hospital clinics, appears to include an increased frequency of other somatic and psychological complaints including fatigue, depression, and bowel and bladder disturbance.[1–3] We and others have also shown that in the community there are important associations between widespread pain and multiple tender points, and that they represent measures of general distress rather than being a distinct disease entity.[4–7]

Localised musculoskeletal pain may also be accompanied by points which are tender to pressure, or at which pressure reproduces the pain—the so called regional myofascial pain syndromes.[8] The relationship between the latter and fibromyalgia is not clear. It may be a qualitative difference, in which the generalised problem is greater than suggested by the sum of the individual regional symptoms. Alternatively, it may be one of degree, with fibromyalgia simply the co-occurrence of multiple regional pains. If this latter hypothesis were true, then it might be expected that the relationship between pain and the occurrence of tender points would not be restricted to those with pain that was widespread.

We postulate that, in the population, tender points and pain occur in localised forms, and that there is no unique association between widespread pain and the presence of tender points. A corollary of this is that there may be somatic markers of distress other than strictly defined widespread pain which would be equally, if not more strongly, associated with high tender point counts.

Subjects and methods

The design was a two stage cross sectional survey of an adult population, using an initial postal questionnaire about pain symptoms as the sampling frame for tender point examination. Details of the survey have been described elsewhere.[5] In brief, the study setting was the catchment area of two general practices in the North West of England, one a former mill town and the other a suburban area of Manchester. The initial sampling base for the study was the age-gender register in each practice.

A survey of self reported pain complaints was carried out in an age stratified random sample of all adults aged 18 to 85 years registered at the two practices. The questionnaire enquired about any pain experienced during the previous month that had lasted for longer than 24 hours. It included a mannikin on which study subjects could locate their pain, and a question about the total duration of pain. There was also a set of individual statements about pain: 'I ache all over', 'I have pain in my muscles', 'Pain wakes me during the night', 'I have pain in my joints', and 'I feel stiff when I get out of bed in the morning'. The subjects were asked to indicate the applicability of each statement separately.

The results of this pain survey have been reported previously.[5] There were 1340 replies out of a possible 2034: a response rate of 66%. A study of a sample of non-responders indicated that their prevalence of chronic pain was similar to that among the responders.

On the basis of their answers, subjects were categorised into three groups: those with chronic widespread pain, as defined by the

American College of Rheumatology (ACR) criteria—that is, pain present for more than three months and involving the axial skeleton and at least two contralateral quadrants of the body,[1] the borders of the quadrants being defined by the central axis of the mannikin and the waist; all those subjects with regional pain during the previous month that had lasted for longer than 24 hours, other than those with chronic widespread pain as defined above; those with no pain during the previous month.

The prevalence of the three groups in the postal survey was 13%, 43%, and 44%, respectively. For the present study, subjects were sampled according to their pain group, to ensure adequate representation of those who had reported chronic widespread pain. Thus 100 names were sampled randomly from the group with chronic widespread pain, and a further 100 subjects with regional pain and 50 with no pain were selected to have a similar age and gender distribution. These 250 subjects were invited to have an interview and tender point examination in their homes.

The visits took place in the 12 months following the postal survey, the interviewing nurse being unaware of the subject's original pain complaints. As pain status might have changed during this interval, a self administered questionnaire about recent pain, identical to that in the postal survey, was completed on the day of interview. The nurse's visit also incorporated an examination for tender points and an interview. The tender point examination was conducted as recommended in the ACR criteria.[1] This involved systematic examination of 18 designated points at nine symmetrical sites. Manual pressure was applied with the thumb and was demonstrated at a control site first. Subjects were told to expect a sensation of pressure, but to indicate if this became painful. We added an explicit definition of 'definite tenderness', which was considered to be present at any of the points examined if some involuntary verbal or facial expression of pain occurred, or a bodily wince or withdrawal was observed.[6] The amount of manual pressure applied by the nurse was tested periodically against a dolorimeter. Standardisation and repeatability of the manual examination were established in a sample of subjects from this study and in groups of hospital patients.

ANALYSES

Pain mannikins completed on the day of interview and examination were used to assess the topographical distribution of pain using two approaches. First, the mannikins were coded according to the presence of shading in each of the six areas designated by the ACR criteria: four limb quadrants, and upper and lower axial skeleton. For each subject, the number (0 to six) of painful segments and whether they satisfied the ACR criteria for widespread pain (axial + two contralateral limb segments) was calculated. Second, the mannikins were divided arbitrarily into 25 topographical areas, with each limb being divided into four regions: hand (foot), forearm (calf), elbow (knee), upper arm (thigh); the other nine areas were scalp, anterior neck/sternum, left and right anterior rib cage, anterior abdominal wall, left and right posterior rib cage, spine and loins.

Tender points were then allocated to the same predefined pain regions using both the above models—for example, the right medial fat pad of the knee point was scored for its presence or absence in the presence of right lower limb pain (six area model) and right knee region pain (25 area model). Associations were expressed as odds ratios with 95% confidence intervals. The median numbers and interquartile ranges of tender points were then analysed in relation to the total number (0 to six) of painful areas.

Finally, we analysed the ability of each of the various individual pain statements, as recorded in the baseline postal questionnaire, to predict high tender point counts when the subject was examined subsequently. For this, the likelihood ratio was used—that is, what is the increase in probability of detecting an individual with a high tender point count, given an earlier positive pain statement? Two cut offs were chosen for this analysis: the median number (five), and the ACR criteria number (11) of tender points. As we wished to extrapolate the associations to the general population, the data were analysed taking account of the baseline population frequencies of the different pain statements. Those that were examined were not a random sample of all responders, but were stratified by their pain status as described above. The different sampling fractions were then applied to the numbers examined in each of the pain groups, to permit an estimate of the sensitivity and specificity in the general population.

Results

A total of 177 subjects (57 men and 120 women; mean age 53 years) agreed to both interview and examination (71% of the sample). These comprised 59 with widespread pain, 82 with regional pain, and 36 with no pain. Reasons for exclusion of the other subjects sampled (n = 73) included: moved residence or not traced (n = 29), refused interview (n = 21), declined tender point count (n = 14), died or too ill (n = 4), other reasons (n = 5). The loss was similar from each of the three pain groups sampled.

Table 1 shows the relationship between the presence of a tender point and of shading in the corresponding area of the six area mannikin. There was wide variation in the prevalence of a positive tender point by site. For all sites, however, there was a significant positive association between finding a tender point if local pain was present, compared with presence of a tender point if the relevant area had not been shaded. The strength of the associations was broadly similar for all nine tender point sites. The associations were also similar between right and left, though there was an unexplained stronger association with the right trochanter point. Repeating the analysis using the 25 site

Table 1 Association between tender point presence and pain localised to same site: six region model

Tender point area	Number with pain in section	Odds ratio	95% CI
Suboccipital right	92	3·15	1·59 to 6·27
Suboccipital left	81	1·76	0·94 to 3·28
Trapezius right	92	2·71	1·34 to 5·48
Trapezius left	81	2·21	1·14 to 4·30
Supraspinatus right	92	2·95	1·28 to 6·80
Supraspinatus left	81	1·34	0·54 to 3·35
Elbow right	92	1·40	0·77 to 2·56
Elbow left	81	2·22	1·21 to 4·10
Trochanter right	78	7·19	1·98 to 26·07
Trochanter left	74	1·22	0·49 to 2·99
Knee right	78	2·55	1·37 to 4·77
Knee left	74	2·98	1·59 to 5·60
Intertransverse right	57	1·20	0·63 to 2·29
Intertransverse left	57	1·49	0·76 to 2·92
2nd rib right	57	2·90	1·42 to 5·92
2nd rib left	57	1·92	0·93 to 3·95
Gluteal right	52	2·83	1·35 to 5·91
Gluteal left	52	3·33	1·61 to 6·91

CI = Confidence interval.

Table 2 Association between tender point presence and pain localised to same site: 25 region model

Tender point area	Number with pain in section	Odds ratio	95% CI
Suboccipital right	25	2·71	1·14 to 6·42
Suboccipital left	25	2·04	0·87 to 4·79
Trapezius right	55	2·85	1·43 to 5·69
Trapezius left	56	2·36	1·20 to 4·65
Supraspinatus right	13	2·92	0·89 to 9·61
Supraspinatus left	12	2·63	0·65 to 10·62
Elbow right	18	0·91	0·36 to 2·32
Elbow left	20	2·73	1·00 to 7·49
Trochanter right	48	11·14	3·42 to 36·34
Trochanter left	42	1·95	0·75 to 5·04
Knee right	40	1·64	0·80 to 3·34
Knee left	40	2·08	1·02 to 4·27
Intertransverse right	55	2·24	1·15 to 4·38
Intertransverse left	56	1·06	0·55 to 2·04
2nd rib right	7	20·59	2·40 to 176·53
2nd rib left	7	22·29	2·60 to 191·25
Gluteal right	48	3·71	1·76 to 7·84
Gluteal left	42	1·82	0·85 to 3·92

CI = Confidence interval.

model did not strengthen the associations, apart from the very strong relationships between anterior chest pain and tenderness of the second rib (table 2).

As the number of broad pain segments increased from 0 to six, the median number of tender points increased, though there appeared to be a threshold of four or more painful regions (table 3). Interestingly, despite the long interval between the baseline screening questionnaire and the examination, using the number of painful segments reported at baseline a trend was observed that was similar to that observed using the number reported on the day of examination.

Table 4 shows the associations between different pain statements at baseline and a high tender point count at interview, after adjusting for the sampling method as described above. These are compared with the association between mannikin defined chronic widespread pain and a high tender point count. The data show that the statements were similar in their ability to identify either those individuals with five or more tender points, or those with 11 or more. 'I ache all over' as a simple statement and mannikin based chronic widespread pain (ACR definition) had the greatest likelihood ratios, whereas the presence of 'muscle pain' had the smallest. The presence of ACR criteria positive widespread pain only detected 35% of those with 11 or more tender points.

Table 3 Trend in tender point count by number of painful sections

Number of painful sections	n	Median tender point count	Inter quartile range
0	35	3·0	1–6
1	20	3·5	1–6·5
2	22	4·0	2–7
3	18	3·5	1–9
4	22	6·5	2–10
5	29	6·0	2–12
6	31	8·0	4–12

Discussion

This study has identified some important characteristics of the occurrence of tender points and pain in the general population. First, pain in a particular segment of the body is associated with an increased likelihood of detecting tenderness at one of the ACR tender points in that segment. Second, defining the pain segments more closely does not increase the association for most tender point sites, suggesting that it is not necessarily the same local structure that is giving rise to the pain and the tenderness.

We have also shown that there appears to be a continuum of increasing number of tender points with number of painful body segments, and that there is not a unique cut off at which both features occur concurrently in a widespread form. This would be consistent with the observation that fibromyalgia does, indeed, represent one end of a spectrum of pain and tender points, and that both traits are probably continuous in the general population.

Finally, it is of interest to consider the performance of the pain statements that, in contrast to the mannikin derived pain categories, were analysed from responses in the baseline postal questionnaire. The simple statement that 'I ache all over', which is different from mannikin derived chronic widespread pain, is the most discriminatory for the identification of

Table 4 Association between pain symptom status and high tender point count

Pain symptom status	Ability to classify correctly					
	Tender point count >5			Tender point count >11		
	Sensitivity (%)	Specificity (%)	Likelihood ratio	Sensitivity (%)	Specificity (%)	Likelihood ratio
Chronic widespread pain (ACR)	22	95	4·4	35	92	4·4
'I ache all over'	13	98	4·7	19	96	4·4
'I have pain in my muscles'	36	77	1·6	42	74	1·7
'I feel stiff when I get out of bed'	60	81	3·2	78	73	2·9
'I have pain in my back'	50	78	2·3	53	70	1·8

ACR = American College of Rheumatology.

high number of tender points in the general population, confirming similar observations from clinic based studies.[7] In contrast, it is clearly not self reported muscle pain that is the hallmark of the high tender point count. The interval between the baseline postal questionnaire in which the pain statements were gathered and the day of tender point examination ranged from one to 12 months, with the consequent likelihood that responses might have changed during the interval. Two observations are of note. First, despite the interval, there appeared to be important differences in the performance of the baseline statements. Second, these data would be consistent with the 'I ache all over' response being a more persistent state.

There are a number of methodological issues to be considered. First, there was an important non-response rate to both the original mailing and the follow up. We have shown previously that the non-responders to the first mailing were not importantly different in terms of their pain experience.[5] The non-responders to the request for interview may have been selectively different in their current pain and tender point experience, though it is less likely that the association between these variables is substantially different.

The subjects chosen for interview and tender point examination were selected on the basis of ensuring reasonable numbers of those with widespread pain, as stated earlier. In order to extrapolate the observed associations to the general population we assumed that, for a given pain statement, those examined were representative of those not sampled. We thus used the frequencies of those positive for the different pain categories in the baseline survey to estimate the population sensitivity and specificity in identifying high tender point counts.

In summary, this evidence suggests that the more extensive the pain, the more tender points will be found, and one conclusion is that, in the general population, the relationship between regional pain complaints and fibromyalgia is one of degree, not of qualitative difference. There have been other indications in the literature that this was likely to be so. Buskila *et al*,[9] for example, showed that dolorimetry scores at 'control' sites (locations not included in the fibromyalgia classification) were greater in patients with chronic widespread pain that in those without. It is important, therefore, to determine whether those with widespread pain and tender points differ in their prognosis from those with a more limited syndrome. We are carrying out a prospective study in the general population to investigate this.

It is of interest to compare our findings with those reported by the ACR Multicentre Study,[10] which are generally accepted as the most useful classification criteria for clinical studies. One obvious source of variation, for example, is our more stringent cut off for a positive tender point, which involved a physical expression of pain. However, the objectives of the two studies were clearly different. Our purpose was to examine subjects in the general population, in order to shed light on the more general link between pain and tender points.

This study was supported by a grant from the Arthritis & Rheumatism Council, UK, and the North West Regional Health Authority. We thank Dr John Sandars, Dr Gerald Coope, and their partners and staff of the general practices in the study, and Dr Jeff Marks of Stepping Hill Hospital for help with the pilot studies.

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