Population study of tender point counts and pain as evidence of fibromyalgia

Peter Croft, Joanna Schollum, Alan Silman

Abstract

***Objective*—To determine the relation between tender points, complaints of pain, and symptoms of depression, fatigue, and sleep quality in the general population.**

***Design*—Two stage cross sectional study with an initial questionnaire about pain to classify those eligible for an examination of tender points.**

***Setting*—Two general practices in north west England.**

***Subjects*—Stratified random sample of adults from age-sex registers. Of the responders, 250 were selected for examination of tender points on the basis of their reported pain complaints; 177 subsequently participated.**

***Main outcome measures*—Tender point count (0 to 18) grouped into four categories with the highest (≥ 11) corresponding to the criteria of the American College of Rheumatology for fibromyalgia. Assessment of pain (chronic widespread, regional, none). Measures of depression, fatigue, and difficulty with sleeping.**

***Results*—Women had a higher median tender point count (six) than did men (three). Counts were higher in those with pain than in those who had no pain and in those with widespread compared with regional pain. Most subjects with chronic widespread pain, however, had fewer than 11 tender points (27/45; 60%). Two people with counts of 11 or more were in the group reporting no pain. Mean symptom scores for depression, fatigue, and sleep problems increased as the tender point count rose (P value for trend $<0{\cdot}001$). These trends were independent of pain complaints.**

***Conclusions*—Tender points are a measure of general distress. They are related to pain complaints but are separately associated with fatigue and depression. Sleep problems are associated with tender points, although prospective studies are needed to determine whether they cause tenderness to develop. Fibromyalgia does not seem to be a distinct disease entity.**

Introduction

Persistent musculoskeletal pain with no obvious underlying pathology is a diagnostic and management puzzle. Recent attempts at characterising such pain in clinical terms have focused on the concept of fibromyalgia. The cardinal symptom of this condition is widespread persistent musculoskeletal pain. The distinctive sign is tenderness to pressure at specific sites over muscles or muscle attachments.[1] Other symptoms—notably, sleep problems and fatigue—are often recognised[2]; the extent to which psychological symptoms such as anxiety and depression are involved is not clear.[3]

The fibromyalgia syndrome is reportedly the second most common problem seen by rheumatologists in America[4] and is recognised as a major source of disability in some European countries and in North America.[5] Scepticism persists, however, about the distinctive nature of the condition.[6] One reason is that its clinical description has been based on patients attending rheumatologists. The question arises whether clinical features regarded as diagnostic by specialists reflect the selection process from community to clinic rather than the presence of a distinct disease entity.

We carried out a study to determine the relation of tender points in the general population to complaints of pain, depression, fatigue, and sleep quality.

Subjects and methods

The design was a two stage cross sectional survey of an adult population with an initial postal questionnaire about symptoms as the sampling frame for examinations of tender points. The setting was the catchment area of two general practices in the north 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-sex register in each practice. A survey of self reported complaints of pain was carried out in an age stratified random sample of all adults aged 18 to 84 years registered at the two practices. The questionnaire inquired about any pain experienced during the previous month which had lasted for longer than 24 hours. The results of this pain survey have been reported previously.[7] There were 1340 replies out of a possible 2034 (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, pain was categorised into three groups. Firstly, chronic widespread pain, as defined by the criteria of the American College of Rheumatology—that is, pain for more than three months affecting the axial skeleton and at least two contralateral quadrants of the body[8]; secondly, regional pain included all subjects with pain during the previous month which had lasted for longer than 24 hours, other than those with chronic widespread pain as defined above; and thirdly, no pain during the previous month. The prevalence of the three groups in the postal survey was 13% (174), 43% (576), and 44% (590), 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. A hundred names were sampled randomly from the latter; a further 100 subjects with regional pain and 50 with no pain were then selected to have comparable age and sex distributions. These 250 subjects were invited to have an interview and examination of tender points in their homes. The visits took place in the 12 months after the postal survey with the inteviewing nurse unaware of the subjects' original complaints of pain. During this period status of pain might have changed. Self administered questionnaires about recent pain, identical with those in the postal survey, were therefore completed on the day of examination of tender points.

The nurse's visit incorporated four schedules.

Tender point examination as recommended in the criteria of the American College of Rheumatology.[8] This entailed systematic examination of 18 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. Definite

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tenderness at any of the points was considered to be present if some involuntary verbal or facial expression of pain occurred or a wince or withdrawal was observed. The amount of manual pressure applied by the nurse was tested periodically against a dolorimeter. Standardisation and repeatability of the manual examination was established in a sample of subjects from this study and in groups of patients in hospital.

The *general health questionnaire* is a validated screening instrument for possible clinical depression in the general population.[9] The 12 item version was used. Each item has four possible responses scored 1 to 4, and these were summed for a total score (range 12 to 48). This was analysed as a continuous variable, a higher score indicating a greater likelihood of clinical depression.

Sleep problem scale[10]—The ratings (0 to 5) of the answers to four questions about recent sleep (trouble falling asleep, trouble staying asleep, waking several times, waking tired in the morning) were combined to give a total score ranging from 0 to 20.

Health and fatigue questionnaire—This 14 item schedule has been developed for use in general population samples.[11] Each item has four responses rated 1 to 4, giving a total score between 14 and 56.

Both the general health questionnaire and the health and fatigue questionnaire were self administered by the subjects after the interview and examination. The sleep problem scale was administered by the interviewer.

ANALYSIS

Subjects were categorised into four groups: one group with no tender points, one with tender point counts of 11 or more, and two intermediate groups separated by the median tender point count for all groups combined. In the criteria of the American College of Rheumatology 11 or more tender points is a high count and is the defining characteristic of fibromyalgia.

The relation of tender point counts to pain status was analysed by using the questionnaire completed on the day of the nurse's visit. The associations between counts and measures of depression and fatigue were analysed by examining mean scores from the latter across the four categories of tender points. The sleep problem score had a distribution skewed to the right, and so median values were calculated. Trends were tested by linear regression analysis.

The potential confounding effects of age and sex on each of these associations were examined by multiple regression analysis with tender point count as the continuous outcome variable. Because the distribution of tender point count was skewed its log transformation was used.

TABLE I—*Category of pain on day of examination by category in postal survey*

Category in postal survey	Category on day of examination: Chronic widespread pain (n=45; 25·4%)	Regional pain (n=93; 52·5%)	No pain (n=39; 22·0%)
Chronic widespread pain (n=74)	32 (71·1%)	35 (37·6%)	7 (17·9%)
Regional pain (n=67)	10 (22·2%)	47 (50·5%)	10 (25·6%)
No pain (n=36)	3 (6·7%)	11 (11·8%)	22 (56·4%)

TABLE II—*Tender point counts by pain status on day of examination*

Tender point count	No (%) of subjects	Mean (SD) age (years)	No (%) of women	Pain status on day of examination: No (%) with chronic widespread pain	No (%) with regional pain	No (%) with no pain
0	26 (14·7)	51·1 (15·7)	9 (34·6)	2 (4·4)	14 (15·1)	10 (25·6)
1-4	63 (35·6)	50·4 (14·1)	40 (63·5)	11 (24·4)	33 (35·5)	19 (48·7)
5-10	50 (28·2)	53·3 (14·8)	37 (74·0)	14 (31·1)	28 (30·1)	8 (20·5)
≥11	38 (21·5)	55·9 (11·6)	34 (89·5)	18 (40·0)	18 (19·4)	2 (5·1)
All	177 (100)	52·5 (14·1)	120 (67·8)	45 (100)	93 (100)	39 (100)

TABLE III—*Association of tender point count with depression, fatigue, and sleep problems*

Tender point count	Mean (SD) score on general health questionnaire*	Mean (SD) score on fatigue questionnaire†	Median (interquartile range) score for sleep problems‡
0	20·3 (4·4)	27·4 (5·0)	1·0 (0·0-3·5)
1-4	22·0 (3·9)	28·6 (4·6)	3·0 (0·0-8·0)
5-10	25·3 (6·4)	31·0 (5·5)	6·0 (3·0-12·5)
≥11	27·9 (8·1)	36·4 (7·9)	10·0 (6·5-16·0)
All subjects	23·0 (6·4)	28·0 (6·6)	6·0 (0·0-9·0)
Test for trend§	P<0·001	P<0·001	P<0·001

*Range of total score 12 to 48.
†Range of total score 14 to 56.
‡Range of total score 0 to 20.
§From simple linear regression analysis.

TABLE IV—*Association of tender point count with depression, fatigue, and sleep problems according to pain status on day of examination*

Tender point count	Chronic widespread pain	Regional pain	No pain
*Mean (SD) score on general health questionnaire**			
0	18·0 (1·4)	21·7 (4·7)	18·3 (3·5)
1-4	23·9 (4·1)	21·5 (2·9)	21·9 (5·1)
5-10	26·8 (7·4)	24·8 (5·4)	24·8 (7·9)
≥11	28·7 (9·4)	27·8 (7·3)	22·5 (3·5)
*Mean (SD) score for fatigue**			
0	29·0 (2·8)	28·8 (4·9)	24·3 (4·8)
1-4	32·4 (6·8)	28·1 (3·4)	27·8 (4·3)
5-10	32·3 (7·7)	31·5 (4·5)	27·8 (3·1)
≥11	38·8 (8·6)	34·7 (6·9)	32·0 (7·1)
*Median (interquartile range) score for sleep**			
0	4·0 (0-8)	2·0 (0-5)	0·0 (0-1)
1-4	7·0 (1-11)	3·0 (1-9)	1·0 (0-7)
5-10	10·0 (4-15)	6·0 (2-12)	5·5 (2-12)
≥11	13·5 (8-16)	8·0 (6-14)	10·0 (7-13)

*See footnote to table III for ranges of scores.

Results

A total of 177 subjects (mean age 53 years; 57 men and 120 women) agreed to interview and examination (71% of the sample). Reasons for exclusion of the 73 others were that they had moved or could not be traced (29), they refused to be interviewed (21), they declined having a count of tender points (14), they had died or were too ill (four), and other reasons (five). The loss was similar from each of the three pain groups sampled.

Table I shows pain status on the day of examination stratified according to the pain reported in the original postal survey. Overall, fewer subjects on the day of interview reported chronic widespread pain and more had regional pain compared with their status at baseline. The pain status used in each of the following analyses was that on the day of interview.

For all pain groups combined the median number of tender points was four. Most subjects had one or more tender points, with 26 subjects (14·7%) having no tender points and 38 (21·5%) having 11 or more (table II). There was a striking rise in the proportion of women across categories of tender points. Overall, women had a median count of six, three points higher than that in men.

The proportion of subjects with chronic widespread pain rose with the increase in tender point count (table II), but most of them (27/45; 60%) had a total count below 11. Counts of 11 and above were also found in subjects who had regional pain or no pain, but the proportions were lower than among those with chronic widespread pain.

Table III shows the scores on the general health questionnaire, the health and fatigue questionnaire, and the sleep problem score according to category of tender points. For each of these three variables the mean or median score increased with tender point count; the linear trends, calculated by simple linear regression, were significant.

In table IV the same associations are shown separately

within each pain group. For each category of tender points the mean or median scores on the three questionnaire scales tended to be lowest in the no pain group and highest in the chronic widespread pain group. Within each pain group, however, the mean or median scores increased as the tender point count rose. This indicates that associations of tender points with depression, fatigue, and sleep problem scores were not simply reflecting concurrent pain status.

In the multiple regression analysis the associations of tender point count (analysed as its logarithmic transformation) with scores of depression, fatigue, and sleep were each examined with age and sex. The three coefficients were little changed by this procedure, indicating that any age and sex differences could not account for the associations.

Discussion

In this population study high tender point counts were associated with chronic widespread pain. Only one in 10 adults, however, have chronic widespread pain at any one time,[7] and most people with high tender point counts in the population will have either no pain or regional complaints. Tender point counts were also associated with symptoms of depression, fatigue, and poor sleep, and these links were observed regardless of the presence or extent of concurrent pain.

POTENTIAL SOURCES OF BIAS

There were several possible biases. The interview responders (177; 71%) might have had different experiences of pain from non-responders, although response was unrelated to pain at baseline. There is no reason to suppose, however, that non-response bias would distort observations of a link between pain and tender points or of an association between tender point counts and other symptoms. We attempted to minimise bias in the collection of information. The nurse who examined the tender points was unaware of the subject's pain status in the baseline survey or on the day of the examination. The depression and fatigue schedules were completed by the patients without help from the nurse. The sleep questions were asked in semistructured format by the nurse as part of a much longer interview schedule about somatic symptoms.

FIBROMYALGIA IN THE GENERAL POPULATION

Fibromyalgia has been described as a state of altered pain modulation.[12] This may be explained neurophysiologically by peripheral pain persisting or becoming widespread as a result of disturbances in the central nervous system.[13] The latter might entail problems at various levels, such as cervical spine disease, sleep difficulties, or emotional problems. It is not clear why there should be a particular pattern of sites where such altered pain modulation is manifest; indeed most authors would accept that tenderness is often demonstrable at locations other than those proposed in the criteria of the American College of Rheumatology. The college's map of tender points arose from empirical observations such as those of Smythe and Moldofsky.[1] No distinctive feature characterises the nine points, although a number are familiar as sites of regional inflammation of soft tissue (lateral epicondylitis, trochanteric bursitis).

Our results suggest that features associated with the tender point count in the general population are similar to those described in patients with fibromyalgia attending hospital.[14] Counts were higher in women and in subjects who reported pain, especially those with chronic widespread pain. The tender point phenomenon therefore does not simply result from case selection between the community and the specialist clinic.

Clinical and research implications

- Fibromyalgia is said to be characterised by widespread musculoskeletal pain and multiple tender points
- In the population studied here most people with chronic widespread pain did not have high tender point counts, and most people with high tender points did not have chronic widespread pain
- Tender points were associated with pain but were separately related to other measures of distress—namely, depression, fatigue, and in particular poor sleep
- Fibromyalgia does not seem to be a distinct entity in the general population
- Prospective studies are needed to establish the clinical importance of tender points and the role of sleep disturbance in causing musculoskeletal pain to become persistent

Most published series of cases of fibromyalgia have been based on patients with long histories since first diagnosis. In the general population widespread pain of three months or longer may be a much less stable symptom (H Raspe, personal communication). This was why our analysis was based on pain status on the day of examination. It also adds to the concern about interpreting fibromyalgia as a distinct syndrome in population studies.

The tender point count was not bimodally distributed with respect to pain. The combination of chronic widespread pain and high counts seemed to be one end of a spectrum of pain status and tender point counts rather than a distinct entity. Arbitrary definitions of fibromyalgia based on cut off points of tender point counts may be useful for the clinical characterisation and management of individual subjects. For the epidemiological study of the causes and natural history of soft tissue pain and tender points, however, it may be inappropriate to define an entity as fibromyalgia and better to focus on the pattern of complaints of pain and the distribution of tender points.

TENDER POINTS AS A MEASURE OF DISTRESS

Our study has also provided evidence that tender point counts are associated with measures of depression, fatigue, and poor sleep, independent of pain status. Tender points are thus not simply a measure of current pain but may be separately related to central modulators of experience of pain.

Disturbance of sleep has been proposed as the main cause of the fibromyalgia syndrome. In case series or cross sectional studies it is difficult to disentangle cause and effect; it is quite plausible that persistent pain gives rise to the poor sleep. A study of normal volunteers suggested that when their sleep was artificially disturbed tender points developed rapidly,[15] but early studies suggesting a specific sleep anomaly with a characteristic abnormality on electroencephalography have not been replicated.[16] In our study sleep disturbance was consistently and strongly related to tender point counts, even in those with no pain. This lends some support to the idea that poor sleep might give rise to tender points rather than the alternative explanation that pain interrupts sleep.

Fatigue is another symptom considered to be a central part of the fibromyalgia syndrome. Hospital studies have reported an overlap with myalgic encephalomyelitis,[17] and one reason why the label of fibromyalgia is not more common in Britain has

probably been the acceptability of myalgic encephalomyelitis as a diagnosis. Fatigue scores in our study were strongly correlated with depression scores, and a recent prospective study in general practice has confirmed this relation.[18]

Depression as a cause of fibromyalgia is a much debated issue. Persistent pain is a depressing experience. Our finding that the depression score rises with tender point count irrespective of pain status, however, suggests that depression and fatigue may play a part in the genesis of tender points. This fits with the theory of the central modulation of pain experience.

CONCLUSIONS

We conclude that tender points are a measure of general distress. Although they are related to complaints of pain, they seem to be linked separately to depression, fatigue, and poor sleep. Our data support the hypothesis that sleep disturbances may be a factor in the development of tender points, but prospective studies are required to investigate this further. Tender point counts may prove a useful measure in epidemiological studies of the causes of chronic musculoskeletal pain, but high counts do not define a distinct disease entity in the general population.

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Childhood antecedents of schizophrenia and affective illness: social adjustment at ages 7 and 11

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Abstract

***Objective*—To investigate the social adjustment in childhood of people who as adults have psychiatric disorders.**

***Design*—Subjects in a prospectively followed up cohort (the national child development study) who had been admitted as adults to psychiatric hospitals were compared with the rest of the cohort on ratings of social behaviour made by teachers at the ages of 7 and 11 years.**

***Subjects*—40 adult patients with schizophrenic illnesses, 35 with affective psychoses, and 79 with neurotic illness who had been admitted for psychiatric reasons by the age of 28. 1914 randomly selected members of the cohort who had never been admitted for psychiatric treatment.**

***Main outcome measures*—Overall scores and scores for overreaction (externalising behaviour) and underreaction (internalising behaviour) with the Bristol social adjustment guide at ages 7 and 11.**

***Results*—At the age of 7 children who developed schizophrenia were rated by their teachers as manifesting more social maladjustment than controls (overall score 4·3 (SD 2·4) *v* 3·1 (2·0); P < 0·01). This was more apparent in the boys (5 (2·6)) than the girls (3·4 (1·8)) and related to overreactive rather than underreactive behaviour. At both ages prepsychotic (affective) children differed little from normal controls. By the age of 11 preneurotic children, particularly the girls, had an increased rating of maladjustment (including overreactions and underreactions).**

***Conclusion*—Abnormalities of social adjustment are detectable in childhood in some people who develop psychotic illness. Sex and the rate of development of different components of the capacity for social interaction are important determinants of the risk of psychosis and other psychiatric disorders in adulthood.**

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Introduction

Schizophrenic and affective psychoses—the major psychiatric illnesses in adulthood—have a lifetime prevalence (probably similar in different societies) of 2-3%. Onsets are rare before puberty but then rise steeply (earlier in males than females), with a predominant impact in early and middle adult life. Twin, family, and adoption studies establish a genetic role in aetiology, and there is no strong evidence for an environmental factor.

Abnormalities have been reported in patients with schizophrenia and affective disorders long before the onset of psychotic symptoms. People who were admitted to hospital with schizophrenia had lower intelligence quotients (IQ) than their siblings and classmates[1,2] and were also reported by their teachers as exhibiting deviant behaviour.[3,4] These abnormalities (apparently confined to the boys) have been attributed to neurodevelopmental impairment, susceptibility to