Role of mechanical and psychosocial factors in the onset of forearm pain: prospective population based study

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Abstract

Objective To determine the aetiology of forearm pain. In particular to determine the relative contribution of (*a*) psychological factors, features of somatisation, and health anxiety and behaviour, (*b*) work related mechanical factors, and (*c*) work related psychosocial factors in the onset of forearm pain.
Design 2 year prospective population based cohort study, with retrospective assessment of exposures at work.
Setting Altrincham, Greater Manchester.
Participants 1953 individuals aged 18-65 years.
Outcome measures Forearm pain of new onset.
Results At follow up, 105 (8.3%) participants reported forearm pain of new onset lasting at least one day in the past month. Among these, 67% also reported shoulder pain, 65% back pain, and 45% chronic widespread pain. Increased risks of onset were associated with high levels of psychological distress (relative risk 2.4, 95% confidence interval 1.5 to 3.8), reporting at least two other somatic symptoms (1.7, 0.95 to 3.0), and high scores on the illness behaviour subscale of the illness attitude scales. The two work related mechanical exposures associated with the highest risk of forearm pain in the future were repetitive movements of the arm (4.1, 1.7 to 10) or wrists (3.4, 1.3 to 8.7), whereas the strongest work related psychosocial risk was dissatisfaction with support from colleagues or supervisors (4.7, 2.2 to 10).
Conclusions Psychological distress, aspects of illness behaviour, and other somatic symptoms are important predictors of onset of forearm pain in addition to work related psychosocial and mechanical factors. Misleading terms such as "cumulative trauma disorder" or "repetitive strain injury," implying a single uniform aetiology, should be avoided.

Introduction

The aetiology of forearm pain, and conditions of which forearm pain is a feature, has been the subject of intensive controversy.[1] Some believe the pain to be integrally related to exposure to physical factors such as frequent repetitive movements of the upper limb, which can be common in some occupational settings. Others believe that the pain is often a regional manifestation of a fibromyalgia-type syndrome, and that it is associated with high levels of psychological distress and features of somatisation.

We aimed to determine the relative contribution of (*a*) psychological factors, features of somatisation, and health anxiety and behaviour, (*b*) work related mechanical factors, and (*c*) work related psychosocial factors in the onset of new forearm pain.

Participants and methods

We conducted a two year prospective population-based cohort study, with retrospective assessment of exposures in the workplace.

Cohort recruitment

Our study population comprised 1953 participants from a cross sectional survey, conducted one year previously.[2] The sociodemographic characteristics and age and sex structure of the study population were similar to that of the United Kingdom population. The study was approved by the local research ethics committee.

A questionnaire was posted to all participants at baseline, with up to two further questionnaires posted to non-responders. The questionnaire contained a picture of a blank manikin on which respondents were asked to shade the site of any pain experienced during the previous month and lasting at least one day. Among participants not indicating forearm pain, we obtained data on other physical and psychological measures: (*a*) the 12 item general health questionnaire[3]; (*b*) the somatic symptom scale[4]; (*c*) two subscales of the illness attitude scales—health anxiety and illness behaviour,[5] (high scores on the scales indicated, respectively, high levels of health related anxiety and an increased propensity to seek care when experiencing symptoms); and (*d*) other syndromes of regional and widespread pain. We defined chronic widespread pain according to that used by the American College of Rheumatology criteria for fibromyalgia.[6]

Follow up

At two years follow up we sent a postal questionnaire to those respondents who had been free of forearm pain at baseline. We posted up to two further questionnaires to non-respondents.

Pain status

We inquired about forearm pain experienced during the previous month and lasting at least one day. Among participants reporting forearm pain, we

collected further information on date of onset, radiation of the pain to other parts of the upper limb, health seeking behaviour, and whether the pain was associated with disability.

Work related factors

We obtained retrospectively a detailed occupational history for all participants for the entire follow up period. The questionnaires relating to mechanical and psychosocial factors have been used in previous population studies.[7]

Analysis

Participants free of forearm pain at baseline and who provided data at both baseline and follow up were included in the analyses. The risk of developing forearm pain associated with each factor was calculated with Cox regression models and is expressed as relative risk. Among those who reported forearm pain at follow up, occupational exposures were defined as those carried out at the time of onset of the pain. Participants who did not develop forearm pain were assigned a dummy date during the follow up year, chosen at random. To determine whether an individual exposure or a small group of exposures could reliably identify a group at high risk of developing forearm pain, those factors that on univariate analysis showed a significant risk were selected as candidate variables for entry into forward stepwise Cox regression models, in each of the dimensions considered.

Results

At two years' follow up, the postal questionnaire was completed by 1260 participants (adjusted follow up rate of 90%). The prevalence of forearm pain at follow up was 8.3% (105 participants), with little difference between men (8.9%) and women (7.9%). Around one third of participants (34%) reporting forearm pain had consulted their general practitioner about the pain. Pain was also reported in the wrist (66%), hand (45%), and elbow (48%). Regional pain syndromes at other sites were also common among those reporting forearm pain: 67% reported shoulder pain and 65% low back pain whereas 45% satisfied the American College of Rheumatology's definition of chronic widespread pain.

Table 1 Risk of forearm pain at follow up in relation to morbidities or attitudes to illness

Assessment scores at baseline	Forearm pain at follow up: Yes	Forearm pain at follow up: No	Relative risk (95% CI)*
General health questionnaire			
0	36	598	1.0
1-2	26	206	2.1 (1.2 to 3.4)
⩾3	36	241	2.4 (1.5 to 3.8)
Somatic symptom scale			
0	52	677	1.0
1	30	237	1.7 (1.1 to 2.6)
2-5	16	131	1.7 (0.95 to 3.0)
Illness attitude scales			
Health anxiety:			
0-5	24	334	1.0
6-11	35	344	1.4 (0.8 to 2.3)
12-44	39	367	1.4 (0.8 to 2.3)
Illness behaviour:			
0-3	12	348	1.0
4-7	33	356	2.4 (1.3 to 4.7)
8-24	53	341	3.8 (2.0 to 7.1)

*Adjusted for sex and three age groups: 18-39, 40-59, ⩾60.

Table 2 Risk of forearm pain at follow up in relation to occupational mechanical and psychosocial exposures

Baseline exposure	Forearm pain at follow up: Yes	Forearm pain at follow up: No	Relative risk (95% CI)*
Lift or carry weight with one or both hands			
Never	17	337	1.0
Occasionally	14	280	1.0 (0.5 to 2.0)
Half or most of time	10	119	1.7 (0.8 to 3.6)
Push or pull weights			
Never	21	423	1.0
Occasionally	11	216	1.0 (0.5 to 2.1)
Half or most of time	10	95	2.0 (0.96 to 4.3)
Type for 30 minutes without break			
Never	24	418	1.0
Occasionally	11	187	1.0 (0.5 to 2.1)
Half or most of time	7	126	1.0 (0.4 to 2.4)
Repetitive movements of arms			
Never	6	260	1.0
Occasionally	9	212	1.8 (0.6 to 5.1)
Half or most of time	27	265	4.1 (1.7 to 10)
Repetitive movements of wrists			
Never	5	198	1.0
Occasionally	8	222	1.4 (0.4 to 4.2)
Half/most of the time	29	319	3.4 (1.3 to 8.7)
Feel job too hectic or fast			
Never	5	153	1.0
Occasionally	22	351	1.9 (0.7 to 5.0)
Half or most of time	15	237	2.0 (0.7 to 5.6)
Feel job is boring or monotonous			
Never	10	323	1.0
Occasionally	25	327	2.4 (1.2 to 5.0)
Half or most of time	7	90	2.5 (0.95 to 6.6)
Job causes stress or worry			
Never	2	100	1.0
Occasionally	23	377	3.1 (0.7 to 13.1)
Half or most of time	17	264	3.3 (0.7 to 14.2)
Satisfied with support from supervisor or colleagues			
Most of time	10	376	1.0
Half of time	10	186	2.1 (0.9 to 5.1)
Occasionally or never	20	153	4.7 (2.2 to 10)
Feel can learn new things			
Most of time	10	203	1.0
Half of time	3	192	0.3 (0.1 to 1.2)
Occasionally or never	29	343	1.6 (0.8 to 3.3)
Feel can make decisions			
Most of time	26	517	1.0
Half of time	7	135	1.0 (0.4 to 2.4)
Occasionally	9	88	2.0 (0.9 to 4.2)
Feel satisfied with job			
Most of time	26	498	1.0
Half of time	12	163	1.4 (0.7 to 2.8)
Occasionally or never	4	78	1.0 (0.4 to 3.0)

*Adjusted for age and sex.

Risk factors

Morbidities

Participants reporting another regional pain syndrome or chronic widespread pain at baseline were at increased risk of reporting new onset of forearm pain at follow up. Increased risks for developing forearm pain were observed for those with shoulder pain

(relative risk 2.1, 95% confidence interval 1.2 to 3.6), low back pain (2.8, 1.8 to 4.3), or chronic widespread pain (2.6, 1.6 to 4.0). Participants scoring in the middle or highest groups for the general health questionnaire, who reported ever having at least one symptom on the somatic symptom scale or with high scores on the illness behaviour scale, had a significantly increased risk of forearm pain (table 1).

Work related mechanical factors

Of the 105 participants with forearm pain at follow up, 42 (40%) reported being in employment at the time of onset of pain. Of the 1155 participants without forearm pain, 740 were in employment on their assigned dummy date.

In these 782 participants the two mechanical exposures associated with the highest (and significant) risk of future forearm pain were both related to repetitive movements of the upper limb. Moderately increased risks of forearm pain were found for those who reported that for "half or most of the time" in their job they were lifting or carrying weights with one or both hands or pushing or pulling weights (table 2). No increased risk was associated with typing for more than 30 minutes without a break.

Work related psychosocial factors

Onset of forearm pain was related to the level of satisfaction with support from supervisors and colleagues (table 2). Other work related psychosocial factors were not significantly associated with forearm pain.

Multivariate model

We entered four variables into a multivariate Cox regression model, determined by stepwise models in each of the domains. These were repetitive use of the arms; level of satisfaction with support from supervisor or colleagues; high scores on the illness behaviour scale; and high scores on the general health questionnaire. All factors remained important independent predictors of the onset of symptoms (table 3). The prevalence of forearm pain increased from 0.4% among those exposed to none of the four factors to 15.4% for those reporting all factors.

Discussion

Onset of forearm pain was independently related to psychological factors, aspects of illness behaviour, other somatic symptoms, and work related mechanical and psychosocial factors.[7 8] Forearm pain rarely, however, occurs in isolation from other regional pain syndromes.

Forearm pain is a common symptom in occupations that involve writing or keyboard work, with particularly high exposures.[9] Symptoms of "repetitive strain injury" have been found to be consistent with minor polyneuropathy; some studies have shown vascular abnormalities in affected upper limbs.[10–12]

The concept that forearm pain may be one feature of a wider process of somatisation was supported by the observation that participants who developed forearm pain were more likely to report having previously had other somatic symptoms. Similar risk factors have been found for other syndromes of regional pain such as shoulder and back pain, and these are common features of chronic widespread pain and fibromyalgia.[13 14]

Our study emphasises the multifactorial nature of forearm pain in the population. It confirms a long suspected relation between work related repetitive movements and onset of forearm pain but also that the onset of symptoms can be predicted by high levels of psychological distress and adverse work related psychosocial experiences. Future studies examining and refining hypotheses about the aetiology of diffuse forearm pain should consider each of these domains, and misleading terms such as "cumulative trauma disorder" or "repetitive strain injury," implying a single uniform cause, should be avoided.

Table 3 Combined regression model of risk factors for new onset of forearm pain

Exposure	Relative risk (95% CI)
Repetitive movement of arms	
Occasionally	1.2 (0.4 to 3.7)
Half or most of time	2.9 (1.2 to 7.3)
Satisfied with support from supervisor or colleagues	
Half of time	1.6 (0.7 to 3.9)
Occasionally or never	2.6 (1.1 to 5.8)
Illness behaviour score	
4-7	6.6 (1.5 to 29)
8-24	6.6 (1.5 to 29)
General health questionnaire score	
1-2	1.9 (0.8 to 4.5)
≥3	1.8 (0.8 to 4.1)

What is already known on this topic

Several countries have experienced "epidemics" of forearm pain in occupational settings

Little is known about risk factors for onset of forearm pain

What this study adds

High levels of psychological distress, experiencing other somatic symptoms, and aspects of illness behaviour predict onset of forearm pain

In the workplace, repetitive movements of the arms or wrists and adverse psychosocial factors (for example, lack of support from supervisors and colleagues) both predict onset of forearm pain

Forearm pain commonly co-occurs with other regional musculoskeletal pain syndromes

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Clinical governance in primary care

Organisational development for clinical governance

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Underpinning contemporary theories of quality improvement is the axiom that poor individual performance usually reflects wider "system failure" or the absence of an organisation-wide system of quality assurance.[1] In healthcare organisations, critical incidents can lead to death, disability, or permanent discomfort. This, together with clinicians' tendency to protect their individual autonomy and reputation, can promote a culture of blame and secrecy that inhibits the organisational learning necessary to prevent such incidents in future.

Introducing clinical governance to primary care, the government stated that it "must be seen as a systematic approach to quality assurance and improvement within a health organisation … Above all clinical governance is about changing organisational culture … away from a culture of blame to one of learning so that quality infuses all aspects of the organisation's work."[2] This paper seeks to identify the contribution of organisational development to the effective establishment of clinical governance.

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Summary points

Organisational development is a field of applied behavioural science focused on managing change and improving effectiveness in organisations

Four aspects of organisational development are particularly important: cultural change, the development of technical skills, structural change, and the development of effective leadership

Developing the necessary culture for clinical governance will be difficult given the variability of general practices and practitioners

An agenda of control and risk management could jeopardise the inventiveness and innovation that secures continuous improvement

What is the organisation?

The idea of organisation-wide quality improvement poses challenges in a primary care setting. Much care is still provided by relatively isolated professionals based in small practices, which are not typically thought of as "organisations." Newly formed primary care groups and trusts are easier to conceptualise as organisations, but many have yet to develop the sense of cohesion and "organisational belonging" among member clinicians that will be required for effective clinical governance.[3]

Currently, the primary care group is a subcommittee of the health authority, whose chief executive is

This is the third in a series of five articles

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