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INCREASED RATES OF FIBROMYALGIA FOLLOWING CERVICAL SPINE INJURY

A Controlled Study of 161 Cases of Traumatic Injury

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***Objective.* To study the relationship between cervical spine injury and the development of fibromyalgia syndrome (FMS).**

***Methods.* One hundred two patients with neck injury and 59 patients with leg fractures (control group) were assessed for nonarticular tenderness and the presence of FMS. A count of 18 tender points was conducted by thumb palpation, and tenderness thresholds were assessed by dolorimetry at 9 tender sites. All patients were interviewed about the presence and severity of neck and FMS-related symptoms. FMS was diagnosed using the American College of Rheumatology 1990 criteria. Additional questions assessed measures of physical functioning and quality of life (QOL).**

***Results.* Although no patient had a chronic pain syndrome prior to the trauma, FMS was diagnosed following injury in 21.6% of those with neck injury versus 1.7% of the control patients with lower extremity fractures ($P = 0.001$). Almost all symptoms were more common and severe in the group with neck injury. FMS was noted at a mean of 3.2 months (SD 1.1) after the trauma. Neck injury patients with FMS (n = 22) had more tenderness, had more severe and prevalent FMS-related symptoms, and reported lower QOL and more impaired physical functioning than did those without FMS (n = 80). In spite of the injury or the presence of FMS, all patients were employed at the time of examination. Twenty percent of patients with neck injury and 24% of patients with leg fractures filed an insurance claim. Claims were not associated with the presence of FMS, increased FMS symptoms, pain, or impaired functioning.**

***Conclusion.* FMS was 13 times more frequent following neck injury than following lower extremity injury. All patients continued to be employed, and insurance claims were not increased in patients with FMS.**

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Fibromyalgia syndrome (FMS) is a chronic, painful musculoskeletal disorder of unknown etiology (1). A growing body of epidemiologic evidence has shown it to be relatively common, occurring in up to 2% of the general population (2). Despite extensive research, the etiology and pathophysiology of FMS are still unclear. Disturbances in stage 4 sleep (3), hormonal (4,5) and infectious factors (6,7), and stressful conditions (8) have been suggested as possible progenitors. Although equivocal, some evidence has suggested that biomechanical disturbances in the cervical spine may play a role in the pathogenesis of FMS (9). Evidence that trauma can cause FMS comes from a few case series or case reports (10–13) and is insufficient to establish causal relationships (14).

In the UK, neck injuries were shown to occur in more than 45% of road traffic accidents (15). Radanov et al (16) have shown that 2 years after "whiplash" injury of the neck, 18% of patients still had injury-related symptoms, including fatigue, headaches, anxiety, sleep disturbances, sensitivity to external stimuli (light, noise), and muscle tenderness. Interestingly, these manifestations, although not specific, are characteristic of FMS-related symptoms. It is possible that some of the symptomatic patients would have satisfied the criteria for FMS, but this disorder was not studied in the report by Radanov et al (16). Given the similarity of symptoms, we tested the hypothesis that the incidence of FMS should be increased in persons with neck injury compared with those who have lower extremity injuries.

PATIENTS AND METHODS

Patients and controls. We identified all cases of soft tissue neck injuries and leg fractures that occurred in an 18-month period between July 1994 and December 1995, by studying patients attending an occupational clinic. In Israel, persons who are working and have received injuries must attend an occupational clinic. In the southern part of Israel, there is only 1 regional occupational clinic, and it is located in the Soroka Medical Center. Thus, our case review resulted in an almost complete capture of all cases. These cases were designated as neck injury or lower extremity fracture based on diagnoses made by an independent orthopedic surgeon.

One hundred eighty patients were identified and were requested to participate in the study. Of these 180 patients, 161 (89%) agreed to participate. The remaining 19 patients declined, indicating that they were too busy with their jobs to participate.

The study group comprised 102 patients with neck injuries. We used the term "neck injury" to describe nonspecific soft tissue injuries, excluding, during the case selection process, those patients who had radiographic evidence of fractures, dislocations, and subluxations. To include fractures would confound the study question by introducing a level of trauma that is not seen in the context of FMS, and which is often not the issue of interest in FMS. Seventy-four of the 102 patients were involved in road accidents. Sixty-seven of them (90%) fulfilled the classic "whiplash" criteria; i.e., trauma causing cervical musculoligamental sprain or strain due to hyperflexion/hyperextension after being hit from behind. In the remaining 10% of patients, the exact injury was not described.

Twenty-eight of the 102 patients had soft tissue injuries that occurred in the workplace. Injuries were related to lifting or pulling heavy objects or falling from industrial machinery. These 28 patients were employed in chemical, electronics, and textile industries. They indicated that the specific activity that led to the traumatic event was not part of their routine work.

The injury incident represented a single event occurring over a few minutes and not something accumulating over days or weeks. Thus, "repetitive" injury, such as neck pain developing while typing, was not included. None of the 102 patients had head injury or alteration of consciousness.

The control group comprised 59 patients with leg fractures. Thirty-four of them had fractures of the tibia, and 25 had fractures of the femur. All but 1 were injured in the workplace.

All participants gave their written consent after having received detailed information about the study. All patients were interviewed and clinically evaluated for the presence of FMS, and their tenderness threshold was measured. Their quality of life (QOL) and physical functioning were assessed as well. The interview and the examination were performed by the same observer (GV), using a standard written protocol. However, he was not blinded to the site of the injury. None of the patients reported diffuse pain syndrome or related symptoms prior to the injury.

Tenderness assessment. *Tender point (TP) count.* In all patients, a count of 18 TPs at 9 symmetric sites was performed by thumb palpation. Manual pressure was demonstrated at a control site first. Patients were told to expect a sensation of pressure, but to indicate if this became painful. Definite tenderness at any of the points was considered to be present if some involuntary verbal or facial expression of pain occurred or if a wince or withdrawal was observed. The amount of manual pressure applied over a TP was about 4 kg/cm^2 (tested periodically against a dolorimeter). The patients were diagnosed with FMS if they fulfilled the currently accepted 1990 criteria of the American College of Rheumatology (17), namely 1) widespread pain in combination with 2) tenderness of 11 or more of the 18 specific TP sites.

Dolorimetry. Thirteen point sites (9 TP sites and 4 control sites) were further studied by a dolorimeter. The 9 TP sites were as follows: the trapezius (right and left), midpoint of the upper fold; the occiput (right), below the occipital prominence; the cervical spine (right), in the anterior aspect of intertransverse spaces at C5–C7; the second costochondral junction (right), just lateral to the junctions, on the upper surface; the medial knees (right and left), in the medial fat pad of the knees, overlying the medial collateral ligament; the lateral elbow (right), 2 cm distal to the lateral epicondyle; and the greater trochanter (right), 2 cm posterior to the greater trochanter. The 4 control sites were the forehead (middle), the forearm (right distal third), the lateral knee (right), and the shaft of the third metatarsal bone (right).

Threshold of tenderness was measured using a Chatillon dolorimeter, model 719-20, which has a maximum scale of 9 kg. It was fitted with a neoprene stopper footplate with a diameter of 1.4 cm (18). The site of maximum tenderness over TP sites was determined by preliminary light pressure. The footplate of the dolorimeter was then placed appropriately, and if necessary, its location was stabilized with the examiner's nondominant hand to prevent (often painful) shifting of the footplate under pressure, taking care not to add or subtract from the force applied. The dolorimeter was held close to the vertical position. Pressure was increased at the rate of about 1 kg/second.

The patient was asked to say "yes" when the sensation was no longer pressure, but rather had become definite pain. Preliminary measures of control sites were done to familiarize the patient with the process, but also to discourage anticipation or exaggerated responses. All dolorimeter measurements of 13 point sites as well as a total point count were done by 1 observer. Patients were not told which were tender and which were control points, and the points were mixed together in the examination.

Symptoms. Visual analog scales (VAS) were used by each patient to evaluate the current levels of pain, anxiety, depression, fatigue, morning stiffness, and global well-being. The scale was labeled "no pain" to "worst pain." The items were scored on a 0–10-point scale, with 10 denoting the worst possible condition. In addition, the occurrence of the following symptoms was recorded by the interviewer as present or absent: poor concentration, blurred vision, dizziness, forgetfulness, sleep disturbance, headache, paresthesias, subjective joint swelling, and irritable bowel syndrome.

Table 1. Demographic and clinical details on patients with neck injuries and on patients with leg fractures*

Characteristic	Neck injuries (n = 102)	Leg fractures (n = 59)	P
Age, years	40.3 (11.0)	45.4 (9.8)	0.004
No. female/no. male	36/66	16/43	0.285
Education, years	11.5 (2.2)	11.1 (2.1)	0.231
Marital status, no. (%) patients			0.256
Single	16 (16)	4 (7)	
Married	83 (81)	53 (90)	
Divorced	3 (3)	2 (3)	
Time since trauma, months	12.6 (4.4)	12.3 (3.7)	0.592
Self-assessment of initial trauma impact†			
Severity of traumatic event	4.6 (2.3)	3.7 (2.1)	0.016
Severity of dysfunction	3.6 (2.2)	3.3 (2.1)	0.403
Physical independence	0.1 (0.8)	1.2 (6.5)	0.098
Mobility	0.1 (0.5)	0.4 (1.1)	0.017
Insurance claim, no. (%) patients	20 (20)	14 (24)	0.549

* Except where otherwise indicated, values are the mean (SD).
† Assessed by a visual analog scale of 0–10, where 10 = maximal impairment.

QOL assessment. QOL was measured by the QOL Scale (QOLS). The QOLS is a 16-item questionnaire that was adapted by Burckhardt et al (19), from an earlier instrument by Flanagan (20), for use with chronic disease patients. The questionnaire asks respondents to rate their level of satisfaction using a 7-point scale, where 1 = highly dissatisfied and 7 = highly satisfied. The instrument is then aggregated into a mean score for the 16 items. The QOLS was previously validated for use in Hebrew-speaking FMS patients (21).

Physical functioning. Physical functioning was assessed by questions 1–10 of the Fibromyalgia Impact Questionnaire (FIQ). The FIQ was developed and validated by Burckhardt et al (22) to assess the current health status of women with FMS. The part of the FIQ used in the present study is a brief 10-item instrument that measures physical functioning on a 0–3-point scale, where 3 = never able to do. This instrument has recently been translated into Hebrew and was validated by us (23).

Statistical analysis. *T*-tests for independent samples were used to compare quantitative variables (such as tenderness measurements and symptom assessments on the VAS), and chi-square tests (or Fisher's exact test, with small samples) were performed to compare proportions (prevalence of symptoms). Relative risks were computed as odds ratios, and their 95% confidence intervals were given.

RESULTS

Baseline findings in study and control groups. One hundred two consecutive patients with neck injury and 59 patients with leg fractures (control group) were assessed for the presence of FMS symptoms, prevalence of FMS, nonarticular tenderness, QOL, and physical functioning. The main sociodemographic and clinical details are presented in Table 1. The study group and the control group had similar demographic characteristics, except for age, which was somewhat lower in the patients with neck injury. The patients with neck injury assessed their traumatic event as more severe than did the patients with leg fractures ($P = 0.016$). Mobility was more impaired in the leg fractures group than in those with neck injury ($P = 0.017$), but self-assessments of physical independence and severity of dysfunction were similar in both groups. In addition, the rate of insurance claims was not different between the 2 groups: 20% in the patients with neck injury versus 24% in the patients with leg fractures.

Prevalence of symptoms and FMS in study and control groups. The distribution of current symptoms, both trauma- and FMS-related, is shown in Table 2. Almost all symptoms were significantly more prevalent or severe in the patients with neck injury. Table 3 shows the prevalence of FMS and the tenderness measurements (point count and dolorimetry) in the study group and in the control group. The FMS prevalence rate in the neck injury group was 13 times greater than in the leg fractures group (21.6% versus 1.7%; $P = 0.001$). The relative risk of developing FMS following a neck injury compared with that following a lower extremity fracture was 16, with a 95% confidence interval of 3–76.

No patients diagnosed with FMS in the study reported diffuse pain syndromes prior to the work accident. All of them were healthy, active workers prior to the accident, and despite developing FMS, continued

Table 2. Prevalence and severity of symptoms in patients with neck injuries and in patients with leg fractures*

Symptom	Neck injuries (n = 102)	Leg fractures (n = 59)	P
Poor concentration	12 (12)	0 (0)	0.004
Blurred vision	13 (13)	0 (0)	0.004
Dizziness	67 (66)	0 (0)	0.001
Forgetfulness	6 (6)	0 (0)	0.231
Fatigue†	2.0 (2.7)	0.6 (1.6)	0.002
Anxiety†	0.6 (1.6)	0.1 (0.6)	0.030
Depression†	1.6 (3.0)	0.6 (1.6)	0.010
Pain†	1.7 (2.7)	0.6 (1.5)	0.004
Morning stiffness†	1.9 (2.5)	0.4 (1.4)	0.001
Global well-being†	1.9 (2.7)	0.8 (1.9)	0.007
Sleep disturbance	26 (25)	4 (7)	0.010
Headache	31 (30)	6 (10)	0.003
Paresthesias	27 (26)	6 (10)	0.010
Subjective joint swelling	17 (17)	3 (5)	0.030
IBS	4 (4)	1 (2)	0.653

* Except where otherwise indicated, values are the no. (%) of patients. Symptoms were assessed 6–18 months after the trauma. IBS = irritable bowel syndrome.
† Values are the mean (SD) score on a scale of 0–10, where 10 = worst condition.

Table 3. Posttraumatic prevalence of fibromyalgia syndrome (FMS), measures of tenderness, quality of life (QOL), and physical functioning in patients with neck injuries versus patients with leg fractures*

Variable	Neck injuries (n = 102)	Leg fractures (n = 59)	*P*
FMS prevalence, no. (%) patients	22 (21.6)	1 (1.7)	0.001
Tender point count, 18 sites†	5.9 (5.6)	3.1 (4.6)	0.002
Upper body, 12 sites	4.3 (3.7)	1.8 (3.0)	0.001
Lower body, 6 sites	1.0 (1.6)	0.9 (1.3)	0.604
Dolorimeter threshold, 9 sites, kg	3.7 (1.0)	4.3 (1.1)	0.003
QOL‡	4.4 (1.8)	5.4 (1.2)	0.001
FIQ§	0.4 (0.7)	0.2 (0.3)	0.004

* Except where otherwise indicated, values are the mean (SD). FIQ = Fibromyalgia Impact Questionnaire.
† Upper: trapezius, occiput, cervical spine, second costochondral junction, interscapular, lateral epicondyle. Lower: gluteal, greater trochanter, medial knees.
‡ Mean of 16 subitems (scale 0–7, where 7 = maximal satisfaction).
§ Measure of physical functioning; mean of 10 subitems (scale 0–3, where 3 = maximal impairment).

to work. The pain syndrome was noted in the FMS patients (n = 23 [22 in the neck injury group, 1 in the leg fracture group]) at a mean of 3.2 months (SD 1.1) after the trauma. Furthermore, the mean point count was significantly higher and the dolorimetry thresholds were lower in the neck injury group compared with the leg fractures group.

Interestingly, the count of active TPs in the upper part of the body was different in the 2 groups, while it was similar in the lower part. In the neck injury group, the mean (SD) number of TPs in the upper body was significantly higher than that in the leg fractures group (4.3 [3.7] versus 1.8 [3.0]; $P < 0.001$), while the mean number of TPs was similar in the lower body (Table 3). In addition, QOL and physical functioning were significantly more impaired in the patients with neck injury (Table 3).

FMS and non-FMS patients with neck injury. We further divided the neck injury group (n = 102) into patients with (n = 22) and those without (n = 80) FMS (Tables 4, 5, and 6). The demographic background of these 2 groups was similar (age, education level, and time since the accident) (Table 4). However, the FMS patients assessed the impact of the trauma as worse than did patients without FMS; specifically, their functioning, physical independence, and mobility were significantly impaired by the accident (Table 4). As expected, the FMS patients reported a significantly higher prevalence of trauma- and FMS-related symptoms (Table 5). The severity of symptoms (rated on the VAS scale) was also significantly worse in the neck injury patients with FMS.

Similarly, Table 6 demonstrates that FMS patients had more tenderness (higher point count and lower dolorimetry thresholds) than non-FMS patients ($P = 0.001$). Not surprisingly, the QOL and health status (measured by the FIQ) were significantly lower in the FMS patients ($P = 0.001$).

The FMS group (n = 22) included 10 men and 12 women. As expected, the women with FMS had more

Table 4. Demographic and clinical details on neck injury patients with fibromyalgia syndrome (FMS) versus neck injury patients without FMS*

Characteristic	With FMS (n = 22)	Without FMS (n = 80)	*P*
Age, years	42.0 (11.7)	40.0 (10.8)	0.427
No. female/no. male	12/10	24/56	0.033
Education, years	11.5 (2.5)	11.6 (2.1)	0.836
Time since trauma, months	12.0 (4.5)	12.8 (4.5)	0.477
Self-assessment of initial trauma impact†			
Severity of traumatic event	6.6 (2.0)	4.1 (2.0)	0.001
Severity of dysfunction	5.6 (2.2)	3.1 (1.9)	0.001
Physical independence	0.5 (1.7)	0 (0)	0.020
Mobility	0.3 (1.1)	0 (0)	0.010

* Except where otherwise indicated, values are the mean (SD).
† Assessed by a visual analog scale of 0–10, where 10 = maximal impairment.

Table 5. Symptoms in 102 neck injury patients with and without fibromyalgia syndrome (FMS)*

Symptom	With FMS (n = 22)	Without FMS (n = 80)	*P*
Poor concentration	10 (46)	2 (2.5)	0.001
Blurred vision	10 (46)	3 (4)	0.001
Dizziness	21 (96)	46 (58)	0.001
Forgetfulness	5 (23)	1 (1.3)	0.010
Fatigue†	6.3 (1.5)	0.8 (1.5)	0.001
Anxiety†	2.4 (2.5)	0.1 (0.6)	0.001
Depression†	6.6 (2.4)	0.4 (1.4)	0.001
Pain†	6.0 (1.5)	0.6 (1.7)	0.001
Morning stiffness†	5.9 (1.7)	0.8 (1.2)	0.0001
Global well-being†	6.2 (1.4)	0.8 (1.5)	0.001
Sleep disturbance	20 (91)	6 (8)	0.001
Headache	19 (86)	12 (15)	0.001
Paresthesias	20 (91)	7 (9)	0.001
Subjective joint swelling	16 (73)	1 (1)	0.001
IBS	3 (14)	1 (1)	0.030

* Except where otherwise indicated, values are the no. (%) of patients. Symptoms were assessed 6–18 months after the work-related trauma. IBS = irritable bowel syndrome.
† Values are the mean (SD) score on a scale of 0–10, where 10 = worst condition.

tenderness than the men with FMS; the mean (SD) dolorimetry threshold of 9 TPs was 2.1 (2.0) versus 2.5 (3.8), respectively (P = 0.0009). The QOL of women with FMS tended to be better than that of men with FMS (mean [SD] 3.7 [1.1] versus 2.9 [0.9]; P = 0.06). In addition, the physical functioning was significantly better in women with FMS than in men with FMS (1.0 [0.6] versus 1.8 [0.8]; P = 0.015).

Insurance claims. In Israel, all employed persons are insured in a National Insurance Plan. Moreover, all car drivers must be insured by insurance companies. Thus, if an employee has a work-related accident (at the workplace or on the way to it), he or she may file a claim with the National Insurance Plan. An injured driver may file a claim against the "guilty" party's insurance company. In our study, only 20 of 102 patients with neck injuries filed a claim. We were interested in investigating whether neck-injured patients who made insurance claims (n = 20) differed clinically from those who did not make a claim (Table 7). None of the 20 claims were settled at the time of the study interview. As can be seen, except for QOL, which was lower in patients who did not make a claim, no significant differences were observed in any studied variable. Specifically, there was no significant difference regarding tenderness (point count and dolorimetry threshold).

DISCUSSION

The apparent initiation of FMS by a traumatic incident has been reported in a few case series and case reports (10–13). Trauma to the axial skeleton has been suggested as a possible etiologic factor relating to the onset of FMS (24). Indeed, 24% of 81 FMS patients identified trauma as a possible precipitating factor in their illness (24). FMS patients also reported a greater proportion of neck (40%) and lower back (31%) injuries prior to the onset of FMS symptoms (24). However, not all studies have found that trauma is related to disease.

Table 6. Measures of tenderness, quality of life (QOL), and physical functioning in 102 neck injury patients with and without FMS*

Variable	With FMS (n = 22)	Without FMS (n = 80)	*P*
Tender point count, 18 sites	13.4 (1.6)	3.8 (4.5)	0.001
Dolorimeter threshold, 9 sites, kg	2.3 (0.3)	4.2 (0.7)	0.001
QOL	3.3 (1.0)	5.6 (0.9)	0.001
FIQ	1.4 (0.7)	0.2 (0.3)	0.001

* Values are the mean (SD). See Table 3 for definitions.

Table 7. Measures of tenderness, quality of life, and physical functioning in 102 neck injury patients with FMS, by litigation status*

Variable	Insurance claim: Filed (n = 20)	Insurance claim: Not filed (n = 82)	*P*
Prevalence of FMS, no. (%) patients	2 (10)	20 (24)	0.229
Point count, 18 sites	4.1 (4.3)	6.3 (5.9)	0.119
Dolorimeter threshold	4.0 (8.9)	3.7 (1.0)	0.280
QOL	5.6 (1.1)	5.0 (1.3)	0.039
FIQ	0.2 (0.3)	0.5 (0.7)	0.120
Symptoms†			
Pain	1.0 (1.9)	1.9 (2.9)	0.177
Morning stiffness	1.0 (1.6)	2.1 (2.6)	0.079
Fatigue	1.6 (2.2)	2.1 (2.8)	0.443
Anxiety	0.2 (1.1)	0.6 (1.7)	0.318
Depression	0.9 (2.1)	2.0 (3.2)	0.161
Accident severity	4.2 (1.7)	4.7 (2.4)	0.422
Headache, no. (%) patients	4 (20)	27 (33)	0.260
Paresthesias, no. (%) patients	2 (10)	25 (30)	0.063

* Except where otherwise indicated, values are the mean (SD). See Table 3 for definitions.
† Assessed by a visual analog scale of 0–10, where 10 = worst condition.

In a recent study of the natural course of head and neck symptoms after rear-end car collisions, no differences were found regarding the occurrence of neck pain and headaches between persons involved in accidents and their sex- and age-matched control group of uninjured individuals (25). The findings in that report contradict the results of the present study.

Epidemiologic studies of FMS and trauma, specifically neck injuries, are needed to address causality, but are currently not available. The present study is an attempt to clarify the possible contribution of neck trauma to the development of FMS. In order to isolate the relative importance of a mechanical problem (strain or sprain) in the neck, we have chosen, as a control group, patients with trauma in a distant part of the body, namely, fractures in the legs. All patients were chosen from 1 occupational clinic in order to get a homogeneous population.

In this study, we found that 21.6% of patients with neck injury developed FMS shortly after a work accident (3.2 months, on average). This is dramatically higher than the rate of FMS in patients with leg fractures (1.7%; P = 0.001). In fact, this low FMS rate among patients with leg fractures is not significantly different from that reported in the general population (2). None of our FMS patients had widespread pain prior to the accident. Despite the development of FMS, these patients continued to be employed. Furthermore, the patients with neck injury (n = 102) had more tenderness (higher point counts and lower dolorimetry thresholds) and their physical functioning and QOL were more impaired compared with the patients with leg fractures (n = 59). As expected, the QOL, the functional ability, and the tenderness threshold in the neck injury patients with FMS were significantly lower than in the neck injury patients without FMS.

A number of theories and mechanisms have been suggested to explain the relationship between the cervical spine and FMS, including the suggestion that biomechanical disturbances play a role in the pathogenesis of FMS (1,9). While our data do not address these hypotheses, the increased prevalence of FMS following neck injury suggests the possibility that such mechanisms may play a role. The special association of FMS with neck injury is notable because of the interaction between the cervical spine, nocturnal pain, and sleep disturbance. The development of FMS after seemingly minor injury may be explained by reinjury of the affected site in the neck during sleep (9). Interestingly, we found that the mean number of active TPs in the upper part of the body was significantly higher in the patients with neck injuries than in those with leg fractures, while in the lower part of the body, no significant differences were noted (Table 3). This finding suggests that the neck injury may trigger the development of a localized pain syndrome (in the neck and chest area) that evolves into a diffuse musculoskeletal pain disorder, namely, FMS.

A traumatic incident has been suggested as a possible etiologic factor relating to the onset of FMS (10–13). However, our data suggest that some areas of the body are more susceptible than others. Thus, trauma to the neck is associated with a higher incidence of FMS, while even a major trauma to the legs, such as fractures, has no similar impact. Further well-designed prospective studies on FMS and physical trauma in different parts of the body may support our observation.

The FMS causality issue, similar to other work- and injury-related syndromes, may be further complicated by the potential influence of the availability of compensation for the syndrome (14). There has been concern that a diagnosis of FMS may initiate compensation claims. In settings where compensation is widely available, illnesses similar to FMS have been shown to increase in apparent prevalence, as measured by physician visits, and then appear to decrease in prevalence when compensation availability declines (26,27). In our study, no significant differences were observed (except in QOL) between patients who filed insurance claims and those who did not file claims (Table 7). Thus, despite the development of FMS, no association was found between work disability and claims.

The present data in the literature are insufficient to indicate whether causal relationships exist between trauma and FMS. Our study, however, suggests that soft tissue trauma to the neck can result in an increased incidence of FMS compared with other injuries. Future studies addressing the issue of trauma (especially, neck trauma) and FMS should document the chronology of symptoms following a trauma, prospectively and longitudinally. The patient should be assessed for symptoms and tenderness immediately after the accident, and then be repeatedly evaluated using both subjective (e.g., FIQ, QOL, and VAS self-ratings) and objective (point count and dolorimetry threshold) measures. Such a design will enable the clarification of the relationship between trauma, biomechanical problems, and FMS.

A control group of community patients with neck injury, having similar characteristics to the study group, would have been desirable to further understand the relationship between injury and the workplace. However, such a group was not available.

All of the FMS patients in our study returned to work. This is in strong contrast to other study findings (14,28), in which FMS has been associated with work disability. This may be explained in part by the fact that the severity of symptoms in our FMS patients (previously undiagnosed FMS) was milder than that found in FMS patients attending other clinics, and the disease duration was considerably shorter in our patients (10). In addition, the fact that all of our patients returned to work suggests that the social system and the social acceptability of work disability plays a strong role in determining the outcome of trauma and FMS. Thus, trauma may cause FMS, but it does not necessarily cause work disability. These findings have important implications for many industrialized countries.

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