

PSYCHOLOGICAL DISTURBANCES AND AN EXAGGERATED RESPONSE TO PAIN IN PATIENTS WITH WHIPLASH INJURY

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Abstract—Psychological state, response to pain and style of interpreting everyday experiences were measured in 32 patients who had suffered a whiplash injury 1–84 months before the study. For comparison, measures were also obtained in 15 general practice attenders.

Ratings of depression and anxiety were greater in patients than in controls, and patients reported more cold-induced pain during a cold pressor test. Within the patient sample, anxious subjects gave the highest ratings of cold-induced pain. Those with the longest history of pain gave the highest ratings of whiplash injury pain, and were most depressed. Most of these patients were involved in litigation.

The findings demonstrate that, like most patients with chronic pain, whiplash injury sufferers are anxious and depressed. Their psychological distress could be aggravated by litigation. Behavioural assessment and treatment of chronic pain syndromes such as whiplash injury could benefit from early evaluation of the patient's psychological state, and response to standard painful stimuli.

INTRODUCTION

VIOLENT movement of the head during car accidents can cause whiplash injuries to the neck [1]. Patients with whiplash injuries commonly complain of neck pain, headache, dizziness, loss of balance, tinnitus, hearing difficulties, blurred vision, autonomic disturbances, and pain and numbness in the extremities. In most cases the neck is normal on radiological imaging, and on physical examination limited neck mobility and tenderness of the neck joints and shoulder muscles are usually the only positive findings [1].

Symptoms subside within 6 months in approximately 70% of patients [1], but in the remainder with the *late whiplash syndrome* symptoms can persist indefinitely. In a retrospective study of 102 patients with whiplash injuries, symptoms that persisted for more than 2 months (occipital headache, referred symptoms, interscapular pain, abnormal neurological signs and positive radiological findings) indicated a poor prognosis [2]. In some cases, pre-existing degenerative changes in the cervical spine might influence the development of the late whiplash syndrome [2, 3].

Since many patients with the late whiplash syndrome are involved in litigation and appear to be psychologically disturbed, this syndrome is often attributed to malingering or neurosis [4]. However, secondary gain could not be the primary mechanism of the syndrome in the substantial number of patients whose symptoms persist after settlement of their claim [2]. A prospective investigation of the role of psychosocial stress on recovery from whiplash injuries in 78 patients indicated that psychosocial factors, negative affect and personality traits measured shortly after a car accident did not predict the development of the late whiplash syndrome [5]. Initial neck pain intensity, age and injury-related cognitive impairment indicated a

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poor prognosis, thus suggesting that the severity of the injury influenced recovery.

The findings discussed above suggest that psychological disturbances are a secondary feature rather than a primary mechanism of the chronic whiplash injury syndrome. The longer that pain persists, the greater the disruption to normal routine and the greater the likelihood of psychological disturbances [6–8]. If psychological disturbances are a secondary feature of the whiplash syndrome, an increase in disturbance over time would be expected. Psychological disturbances could be compounded by litigation, which is a major source of stress for many patients with chronic pain [9]. These hypotheses were investigated in the present study.

The second aim of our study was to investigate the response to experimental laboratory pain in patients with the whiplash injury syndrome. Chronic back pain appears to decrease sensitivity to experimental pain [10]; in contrast, pain tolerance is lower than normal in patients with episodic tension headaches [11]. Thus, heightened pain perception could be important in some chronically painful conditions. In the present study a cold pressor test was used as a standard method of pain-induction. Since cold should not irritate the mechanism mediating whiplash pain, an increased sensitivity to cold-induced pain would indicate that perception of pain is generally higher than normal in patients with chronic whiplash injuries.

METHOD

Subjects

The patients were 32 females with neck pain that had started after a motor vehicle accident 2 weeks to 84 months before the study (mean period 18.5 months). In 17 patients pain had persisted for more than 6 months (the late whiplash syndrome). The patients were referred by pain specialists, general medical practitioners, physiotherapists, and a clinical psychologist. Patients sought treatment for neck pain, persistent low-grade headache, intermittent migrainous episodes, or shoulder, arm or lower back pain. In most cases pain had started after a rear-end collision to the patient's stationary car. Apart from bruising and a minor fracture of the first thoracic vertebra (one case), no direct injuries were sustained during the accident. For comparison, 15 female patients without a history of chronic pain who attended a local medical practice for a minor complaint (e.g. upper respiratory tract infection, allergies, or repeat prescriptions for the oral contraceptive pill) acted as controls. Ages ranged from 17 to 57 yr (mean age 35 yr) in the patient group, and from 20 to 57 yr (mean age 34 yr) in controls.

All subjects had good command of written and spoken English, and provided informed consent for the procedures.

Procedures

Patients filled out the McGill Pain Questionnaire [12], and a questionnaire concerning duration of pain, whether they were involved in litigation, and demographic variables such as age and sex. Levels of psychological distress were compared between patients and controls with the State-Trait Anxiety Inventory [13], Beck's Depression Inventory [14], and the General Cognitive Error Questionnaire [15]. According to cognitive theorists, making cognitive errors is an important component of depression, and might influence the psychological impact of pain [15].

A cold pressor test was then administered. The nondominant hand was used unless pain was referred to this hand. Subjects immersed their hand to the wrist in a mixture of ice and water, and were asked to move their hand around in the water until the pain became intolerable. Pain tolerance level was defined as the number of seconds that the hand was kept in the ice-water. If they had not already done so, subjects withdrew their hand after 60 sec. Subjects then rated the quality and intensity of pain on the McGill Pain Questionnaire, and on a 100 mm visual analogue scale ranging from 'no pain' to 'worst possible pain'.

Data analyses

Differences between patients and controls in psychological state (anxiety, depression and cognitive errors) were examined with multivariate analysis of variance. Two further analyses investigated differences between groups in ratings of the quality and intensity of pain during the cold pressor test.

Our initial intention was to compare measures taken on patients with the late whiplash syndrome (i.e. pain persisting for more than 6 months) with those taken on patients with acute whiplash injuries. However, preliminary analyses indicated that this distinction was uninformative. Recently published findings suggest that pain persisting for more than 2 months carries a poor prognosis [2]. Instead of arbitrarily defining a chronic pain category, we decided to use Pearson's correlation coefficient to investigate relationships between pain duration, pain severity and psychological state within the patient sample. In addition, relationships between psychological state, and ratings of clinical and cold-induced pain were explored. Whether litigation influenced measures of psychological state and pain was investigated with *t*-tests.

Seventeen of the 32 patients had whiplash pain for less than 1 yr, but nine patients had suffered pain for 2–7 yr, making the distribution of this variable significantly skewed. The distribution of the pain tolerance measure during the cold pressor test was also skewed, because 32 of the 47 subjects withdrew their hand from the ice-water within 30 sec, whereas five subjects tolerated pain for the full 60 sec. A logarithmic transformation was applied to normalise the distribution of both variables.

RESULTS

Differences between patients and controls

Ratings of anxiety and depression were greater in patients than in controls [multivariate $F(4, 42) = 2.63, p < 0.05$], but cognitive errors were similar in the two groups (Table I). The quality [multivariate $F(4, 42) = 3.27, p < 0.05$] and intensity of cold-induced pain [multivariate $F(3, 43) = 6.95, p < 0.001$] differed between patients and controls, with patients reporting greater pain (Table II).

TABLE I.—PSYCHOLOGICAL STATE IN 32 WHIPLASH INJURY PATIENTS AND 15 CONTROLS

	Mean \pm SD		Univariate	
	Patients	Controls	<i>F</i> Ratio	<i>p</i>
State anxiety	41 \pm 14	32 \pm 7	5.63	< 0.05
Trait anxiety	49 \pm 14	37 \pm 9	10.07	< 0.01
Cognitive errors	25 \pm 22	19 \pm 17	0.94	—
Depression	20 \pm 12	11 \pm 10	5.37	< 0.05

TABLE II.—QUALITY AND INTENSITY OF COLD PRESSOR PAIN IN 32 WHIPLASH INJURY PATIENTS AND 15 CONTROLS

	Mean \pm SD		Univariate	
	Patients	Controls	<i>F</i> Ratio	<i>p</i>
Quality of pain				
MPQ: sensory	20 \pm 9	11 \pm 6	10.94	< 0.01
MPQ: affective	4 \pm 4	1 \pm 3	6.34	< 0.05
MPQ: evaluative	3 \pm 2	2 \pm 2	4.49	< 0.05
MPQ: miscellaneous	9 \pm 3	6 \pm 3	12.70	< 0.01
Intensity of pain				
MPQ: total score	36 \pm 15	20 \pm 12	12.99	< 0.01
VAS (mm)	70 \pm 19	54 \pm 23	5.79	< 0.05
Pain tolerance(s)	22 \pm 17	32 \pm 18	4.45*	< 0.05

MPQ: McGill Pain Questionnaire; VAS: Visual Analogue Scale.

**F* ratio for log-transformed data.

Individual differences within the patient sample

Depression scores, and ratings of whiplash injury pain on the sensory and affective dimensions of the McGill Pain Questionnaire, were greatest in patients with long-standing pain (Table III). Depressed patients generally rated their whiplash injury pain highly on the various dimensions of the McGill Pain Questionnaire. Patients with the highest state anxiety scores gave the highest ratings of cold-induced pain on the visual analogue scale and on psychological components of the McGill Pain Questionnaire (Table III). Patients who rated their whiplash injury pain highly on the McGill Pain Questionnaire also gave the highest ratings for cold-induced pain (Pearson's $r = 0.37\text{--}0.43$, $p < 0.05$ for the sensory, affective and miscellaneous dimensions).

TABLE III.—RELATIONSHIP BETWEEN PSYCHOLOGICAL STATE, AND WHIPLASH INJURY AND COLD PRESSOR PAIN IN 32 WHIPLASH INJURY PATIENTS

	Duration of pain	State anxiety	Trait anxiety	Cognitive errors	Depression
Whiplash pain					
Duration	—	0.25	0.33	0.23	0.37*
MPQ: sensory	0.42*	0.11	0.14	−0.15	0.49**
MPQ: affective	0.41*	0.32	0.24	−0.06	0.46**
MPQ: evaluative	0.14	−0.05	−0.12	−0.11	0.33
MPQ: miscellaneous	0.28	0.36*	0.17	0.01	0.41*
Cold pressor pain					
MPQ: sensory	0.14	0.24	0.25	0.08	0.13
MPQ: affective	0.27	0.56***	0.30	0.24	0.30
MPQ: evaluative	0.16	0.40*	0.21	0.11	0.19
MPQ: miscellaneous	0.12	0.40*	0.19	−0.02	0.11
VAS	0.04	0.47**	0.10	0.05	−0.02
Pain tolerance	0.04	−0.10	−0.10	−0.21	−0.06

Pearson's correlation coefficient statistically significant, * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

MPQ: McGill Pain Questionnaire; VAS: Visual Analogue Scale.

Twenty-three of the 32 patients were involved in litigation over their whiplash injury. These patients had suffered from pain for longer than the other nine patients, were more depressed, and rated their whiplash injury pain more highly on the sensory and affective dimensions of the McGill Pain Questionnaire (Table IV). Anxiety, cognitive errors and the response to cold pressor pain were not related to litigation.

TABLE IV.—DURATION OF PAIN, DEPRESSION, AND RATINGS OF SENSORY AND AFFECTIVE COMPONENTS OF WHIPLASH INJURY PAIN IN RELATION TO LITIGATION

	Mean \pm SD		<i>t</i> -test	<i>p</i>
	Litigation (<i>N</i> = 23)	No litigation (<i>N</i> = 9)		
Duration of pain (months)	23 \pm 22	8 \pm 12	2.75*	< 0.01
Depression	22 \pm 13	13 \pm 9	2.07	< 0.05
MPQ: sensory	23 \pm 6	18 \pm 8	2.10	< 0.05
MPQ: affective	7 \pm 3	4 \pm 2	2.09	< 0.05

t-test for log-transformed data.

The most anxious patients made most errors on the Cognitive Error Questionnaire (for state anxiety, $r = 0.40$, $p < 0.05$; for trait anxiety, $r = 0.48$, $p < 0.01$). However, the number of errors was unrelated to ratings of pain or depression.

DISCUSSION

As in most other chronic pain conditions [16], patients with whiplash injuries were more depressed and anxious than healthy controls. Mood disturbances are so common in pain patients [17] that chronic pain is seen by some to be merely another form of depression [18]. Chronic pain and depression probably have different mechanisms [19], but each condition may promote the development of the other. The cross-sectional design of our study did not allow us to study the development of psychological disturbances. However, it is worth noting that depression and ratings of whiplash injury pain, but not anxiety, were greatest in patients with the longest history of pain.

We expected that patients with whiplash injuries would make more errors than normal on the Cognitive Errors Questionnaire, but the lack of support for this hypothesis indicates that other factors were responsible for psychological distress in our patients. Since most were involved in accident-litigation, depression and pain ratings could have been influenced by the pending court case [20]. We recently assessed psychological state, disability and pain in 19 compensation recipients, and in 18 others who had already settled their claim for work-related lower back pain [9]. Compensation recipients showed more signs of psychological distress, had a lower pain tolerance, and rated the psychological component of their pain more highly than those who had settled their claim. Exaggeration of symptoms by chronic pain patients need not be intentional; psychological disturbances stemming from a pending court case could influence the perception of (and response to) pain, particularly if financial security and employment have been affected by the accident.

Patients rated the sensory and psychological components of cold-induced pain more highly than controls, and tolerated the test for a shorter period. Furthermore, the affective aspects of cold-induced pain were rated most highly by patients who gave the highest ratings of state anxiety. These findings suggest that whiplash injury patients have a heightened perception of pain in general, which could contribute to their condition. The perception of pain might alter when pain persists for long periods, perhaps under the influence of psychological factors such as anxiety. In support of this view, Malow and Olson [21] reported that a decrease in pain threshold to focal finger pressure in patients with chronic temporo-mandibular joint pain reverted toward normal after successful treatment. This hypothesis needs to be explored in more detail, because the effect of chronic pain on sensitivity to experimental pain is inconsistent in different pain syndromes, and could depend largely upon the method of pain induction [10].

Patients with chronic disability often show illness behaviors out of proportion to the underlying physical disease [22]. These coping mechanisms are usually assessed by the patient's self-report [22, 23]. We suggest that self-report data should be supplemented by experimental pain induction to determine whether pain perception, in general, is heightened. The outcome of these tests might influence the choice of treatment. For example, the focus of treatment for patients with the whiplash injury

syndrome might be to decrease perception of pain by using distraction techniques or by reducing anticipatory anxiety [16]. Alternatively, patients who give up easily when in pain might benefit from treatment aimed toward increasing their range of activity [24].

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