Factors associated with acute and chronic pain following traumatic spinal cord injuries

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Previous studies have estimated that between 25% and 45% of people with spinal cord injury report severe levels of chronic pain. Few studies have examined this longitudinally. This study examines the primary pain sites, intensity and variability of perceived pain in 76 patients, 6 weeks post injury and 45 patients from the same cohort, 8 year post discharge. Demographic information reveals a close similarity with the database (40 000) from Stover and Fine's cohort (1986). Data was assessed using visual analogue scales, measures were also taken of functional independence (FIM), emotional status and coping. At 6 weeks post injury, most pain is sited in the thoracic spine area, and in the upper and lower limbs. At 1 year post discharge, most pain is reported to be in the thoracic spine area, the lumbar region and the chest. Twenty-three per cent of the 6 week group reported that the intensity of their pain was severe, whilst at 1 year, 41% of the sample complained of severe pain. Factors associated with the pain at both time points were explored using correlational analyses. The emotional, functional and psychological factors that predict pain severity were explored using multiple regression analysis. Twenty-four per cent of those reporting moderate to severe pain at 6 weeks post injury were still reporting pain at 1 year post discharge. This study examines the relative contribution of psychological factors in reported pain.

Keywords: acute pain; chronic pain; spinal cord injury; pain sites; prevalence; psychology

Introduction

Chronic pain has been recognised as a significant complication of spinal cord injury,¹ yet there continues to be controversy about its importance. Some researchers believe that it has a minor impact,² whilst others argue that its impact is significant.^{3,4} Britell and Mariano (1991) summarised the spinal cord injury pain literature and found that the prevalence of pain ranged from 27–77%, providing evidence that it is a major problem and that it should not be neglected. An earlier study⁵ surveyed 200 hospitalised patients with spinal cord injury and reported that over 50% noted abnormal sensations within 6 months of injury which they labelled as pain. Almost half of this sample reported that pain interfered with their functional independence. Most pain was localised to the arms, trunk and legs. Therefore, in terms of suffering and functional restrictions, it is a major factor complicating adjustment to SCI.

Various taxonomies of SCI pain have been proposed, for example, Burke (1973) proposed three i.e. root pain, visceral pain, and diffuse sensory pain. Whereas Britell and Mariano (1991) divided spinal cord injury pain into the following three main categories, i.e. mechanical pain, radicular pain, and central spinal cord dysaesthesia. However, it is

impossible to understand pain using physical concepts alone and there is a widespread recognition of the need to explore the complex interaction of biological, psychological and social factors.^{6–8} This will not only enhance our understanding, but ensure that the management of chronic pain is considered an important component of rehabilitation programmes.

The objectives of this study were to:

- (1) examine the prevalence of chronic pain, post spinal cord injury;
- (2) explore the relationship between pain reported in the acute phase i.e. 6 weeks post injury, and pain reported 1 year post hospital discharge;
- (3) to explore the relationship between reported pain and psychological well-being.

Method

Subjects

Subject groups for the study were all traumatic spinal cord injured patients who were admitted to the National Spinal Injuries Centre, Stoke Mandeville Hospital between August 1990 and 1993. Those included were aged between 16 and 65 years, were able to speak and understand English and had

experienced a traumatic onset of spinal cord injury. Of the 115 patients approached, 15 declined to take part in the study. At 6 weeks, 76 out of the 100 people approached agreed to participate, and 45 from the same cohort were re-examined 1 year post discharge. Thirty-one patients were lost at follow-up, but in a related study of the same cohort (Kennedy, 1995)⁹ no significant functional or demographic differences were found between those who responded and those who dropped out. Ethical approval was obtained.

At 6 weeks, 76% of the sample were male and 24% female. Sixty-eight per cent were paraplegic and 32% tetraplegic. At 1 year post discharge, 85% were male and 15% were female with 59% being paraplegic and 41% being tetraplegic. The high number of people who were paraplegic reflects the number of such patients who were admitted to the centre during the observational period. The demographic profile of the subjects in terms of sex, age at injury and cause of injury is similar to the profile of patients in Stover and Fines' 40 000 cohort.¹⁰

Measures

- 1 Pain Questionnaire; pain intensity, pain variation and sense of control were recorded using a six-point visual analogue scale, similar to that used in previous research.^{11,12} This also recorded onset of pain, areas of pain and area where most severe pain was experienced.
- 2 Functional Independence; this was assessed using the Functional Independence Measure (FIM).¹³
- 3 Depression was measured using the Beck Depression Inventory.¹⁴ This is a well established and standardised 21 item questionnaire assessing emotional, cognitive and somatic aspects of depression. It has been used extensively with SCI patients.^{15,16}
- 4 The State Anxiety Inventory¹⁷ is a 20 item questionnaire assessing symptoms of anxiety and has been used with this population.¹⁵
- 5 Coping Strategies were assessed using the COPE.¹⁸ Eight strategies were explored which included acceptance, positive reinterpretation, active coping, behavioural disengagement, denial, venting emotions, drug use ideation and planning.

Procedure

When patients were medically stable they were given requests for consent and they had 24 h to consider before signing. Hospital respondents were administered the questionnaires in a face-to-face interview by a trained psychology researcher. After discharge, patients were sent questionnaire booklets to complete (by this stage they had already completed about six/seven questionnaires so they were familiar with the booklet). This study was part of a large ongoing study on coping and adjustment in general.

Results

Onset of pain

At 6 weeks post injury, almost 20% of the cohort reported having no pain. At 1 year post hospital discharge, 37% reported having no pain. All those who did report at 6 weeks, 68% retrospectively indicated that the pain began on the day of injury. At 1 year post hospital discharge, almost 80% retrospectively indicated that pain began on the day of injury.

Pain sites

Seventy-seven per cent of subjects complained of pain at or below the level of injury and 23% complained of pain being above the level of injury. (Half of these were people with thoracic injuries, complaining of shoulder pain). The primary pain sites at 6 weeks and 1 year post discharge are presented in Figure 1. Whilst patients complained of pain in their cervical spine, head and shoulder area at 6 weeks, no pain was reported in these sites at 1 year post hospital discharge. At 1 year, more pain appears to be associated with the thoracic spine, lumbar region and groin.

Pain intensity

Over time, there was an increase in the number of people not reporting any pain at all and those reporting very intense pain (Figure 2). Twenty-nine per cent of those complaining of pain at 1 year post discharge had complained of pain at 6 weeks post injury. At 6 weeks, 57% of those with paraplegia reported moderate or severe pain and 43% of those with tetraplegia complained of moderate or severe pain. However, at 1 year, 80% of those complaining of moderate or severe pain were paraplegic and 20% were tetraplegic. A difference was noted in the prevalence of pain between the two groups; at 6 weeks approximately 24% complained of pain in the severe range, whilst at 1 year post discharge, this figure had increased to 41% complaining of severe pain (and at the same time 41% complained of no pain).

Figure 1 Primary pain sites

Figure 2 Perceived pain intensity

Intercorrelations between the variables

Intercorrelations of pain measures, depression, anxiety and functional independence at 6 weeks post injury reveal that only anxiety correlated with pain intensity ($r=0.27$; $P<0.05$). At 1 year post anxiety ($r=0.32$; $P<0.05$), and depression ($r=0.31$; $P<0.05$) correlated significantly with pain intensity.

Multiple regression analysis

A series of forward stepwise multiple regression analyses were performed on the variables collected i.e. pain, functional independence, depression, anxiety and the eight coping strategies. In terms of the variables predicting pain intensity, anxiety was the only independent variable which predicted aspects of the variance in pain perception. At 6 weeks, 6% of the variance was accounted for by anxiety and at 1 year post discharge, 8% of the variance, i.e. factors other than emotional status and coping strategies account for the variance in reported pain intensity. When pain intensity at 6 weeks is entered into the pool of independent variables in the multiple regression analysis at year one, it is found to account for 29% of the variance, suggesting that the presence of pain at 6 weeks is the most significant predictor of pain at 1 year post discharge irrespective of psychological status. (Table 1).

Discussion

This study demonstrates the prevalence of both acute and chronic pain, post spinal cord injury. Within the acute category 24% of respondents (i.e. 6 weeks post injury) reported very intense pain, whilst the prevalence of chronic pain (at 1 year post hospital discharge) was found to be 41%. This prevalence is similar to that reported by Umlauf (1987)¹⁹ and Britell and Mariano,⁴ both studies reported a prevalence of approximately 40%. These results demonstrate that chronic pain is a significant complication post injury and confirm the need to address pain management when planning

Table 1 Variables predicting pain intensity

<i>Time</i>	<i>Independent variables</i>	<i>AdjR²</i>	<i>Beta</i>	<i>t value</i>	<i>Variables not in Model (f < 4)</i>
6 weeks post injury	Anxiety	0.06	0.03	2.3*	Denial Acceptance Functional independence Depression Behavioural disengagement Active coping Alcohol ideation Positive reinterpretation
1 year post discharge	Anxiety	0.08	0.05	2.2*	Functional independence Active coping Positive coping Positive reinterpretation Acceptance Depression Alcohol ideation Behavioural disengagement Denial

$$* = P < 0.05$$

rehabilitation services for people with spinal cord injury.

Perceived pain at 6 weeks was the most predictive factor, above psychological and functional variables, of pain at 1 year post hospital discharge. Twenty-four per cent of those reporting pain at 6 weeks were complaining 1 year after discharge. Anxiety and depression were more likely to be associated with pain intensity over time and those with severe pain were more likely to be paraplegic than tetraplegic at 1 year post hospital discharge.

In exploring the variables predicting pain, functional status, emotional status and coping variables did not predict significant levels of the variance in pain intensity suggesting that factors other than these account for the experience of intense pain following spinal cord injury, and that these other factors require further investigation.

This study has addressed some of the issues associated with chronic pain post spinal cord injury. The results highlight the need for further investigation of this issue. Future studies should include more thorough assessments of the pain sites, types of pain and records of frequency and duration. Other physical or organic factors will need to be explored to help understand the nature of this problem. These results challenge the belief that pain complaining is solely the manifestation of underlying psychological or adjustment difficulties. Nevertheless, psychological techni-

ques are beneficial in the management of chronic pain. A recent meta-analysis⁷ reviewed 300 studies and of the 65 that met the inclusion criteria, (involving over 3000 patients) found that 60% of patients improved in the short-term and 38% improved in the long-term. These multidisciplinary interventions incorporated a range of approaches to produce positive outcome in a number of behavioural and functional goals that included structured physiotherapy, relaxation training, operant behaviour therapy and cognitive restructuring.

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References

- 1 Burke DC. Pain in Paraplegia. *Paraplegia* 1973; **10**: 297–313.
- 2 Cohen *et al.* Comparing chronic pain from spinal cord injury to chronic pain from other origins. *Pain* 1988; **35**: 57–63.
- 3 Umlauf RL. Psychological Interventions for Chronic Pain following spinal cord injury. *The Clinical Journal of Pain* 1992; **8**: 111–118.
- 4 Britell WW, Mariano AJ. Chronic Pain in spinal cord injury. In NE Walsh (ed) *Physical Medicine and Rehabilitation*, State of the order of reviews; Rehabilitation of chronic pain. Handley & Belfus; Philadelphia, 1991, pp 71–82.
- 5 Nepomuceno C *et al.* Pain in Patients with spinal cord injury. *Archives of Physical Medicine and Rehabilitation*, 1979; **60**: pp 605–609.
- 6 Turk D, Rudy T. Assessment of Cognitive factors in chronic pain; a worthwhile enterprise? *Journal of Consulting and Clinical Psychology* 1986; **54**: 760–768.
- 7 Flor H, Fydrich T, Turk D. Efficacy of Multidisciplinary Pain Treatment Centres; a meta-analytic review. *Pain* 1992; **49**: 221–230.
- 8 Melzack R, Wall P. *The Textbook of Pain*. 2nd Edition, Churchill Livingstone; New York 1989.
- 9 Kennedy P. *Psychological Aspects of Spinal Cord Injury: Behavioural approaches, emotional impact and coping strategies*. Volume 2, unpublished Doctoral thesis, University of Ulster.
- 10 Stover S, Fine R. *Spinal Cord Injury; the fact and figures*. University of Alabama, Birmingham; Alabama, 1986.
- 11 Budzynski TH, Stoyva JM, Adler CM, Mullaney DJ. BMJ Biofeedback and Tension Headache; a controlled outcome study. *Psychosomatic Medicine* 1973; **35**: 484–496.
- 12 Turk D, Rudy T. Assessment and Treatment of Chronic Pain Patients; towards a multiaxial approach. The Centre for Pain Evaluation and Treatment, 1987; University of Pittsburgh.
- 13 Hamilton D, Grainger T. Guide to the Use of the Uniform Data set for medical rehabilitation. Research Foundation of State University of New York, 1990; Buffalo, New York.
- 14 Beck A, Steer, A. *Beck Depression Inventory Manual*, Harcourt, Brace & Jovanovich 1987; San Antonio, Texas.
- 15 Kennedy P, Lowe R, Grey N, Short E. Traumatic spinal cord injury and psychological impact: A cross-sectional analysis of coping strategies. *British Journal of Clinical Psychology* 1995; **34**: 627–639.
- 16 Frank RG, Elliott T, Corcoran J, Wonderlich S. Depression After Spinal Cord Injury: Is it necessary? *Clinical Psychology Review*, 1987; **7**: 611–630.
- 17 Spielberger C *et al.* *Manual for the State Trait Anxiety Inventory*, (Form Y). Consulting Psychologists Press Inc. 1983, Palo Alto, California.
- 18 Carver CS, Scheier MF, Weintraub JK (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, **56**: 267–283.
- 19 Umlauf RL. Prevalence and Nature of the pain experience in spinal cord injured people. *Presentation at the 8th Annual Meeting of the Society of Behavioural Medicine*, Washington DC 1987.