Claims for personal injury after whiplash injury cost the economy of the United Kingdom more than £3 billion per year, yet only very few patients have radiologically demonstrable pathology. Those sustaining fractures of the cervical spine have been subjected to greater force and may reasonably be expected to have worse symptoms than those with whiplash injuries.

Using the neck disability index as the outcome measure, we compared pain and functional disability in four groups of patients who had suffered injury to the cervical spine. After a mean follow-up of 3.5 years, patients who had sustained fractures of the cervical spine had significantly lower levels of pain and disability than those who had received whiplash injuries and were pursuing compensation (p < 0.01), but had similar levels to those whiplash sufferers who had settled litigation or had never sought compensation.

Functional recovery after neck injury was unrelated to the physical insult. The increased morbidity in whiplash patients is likely to be psychological and is associated with litigation.

Whiplash injury accounts for 85% of all claims for personal injury for motor accidents in the United Kingdom, costing over £3 billion each year. Patients with whiplash injury usually have normal radiographs and cervical fracture is rarely seen. Those sustaining fractures of the cervical spine by other mechanisms have usually been subject to high-energy trauma and their prognosis may reasonably be expected to be worse. Our aim was to compare symptoms in patients with fractures of the cervical spine, with no neurological deficit, with those in an age- and gender-matched cohort of patients with whiplash injury.

In the period from January 1998 to January 2000, 25 patients sustained stable fractures of the cervical spine of whom we were able to contact 20 (80%). Only three of these 20 were female. The median age at injury was 30.5 years (16 to 68). The median follow-up was 45 months (12 to 62). The injuries sustained by these patients included fractures of the vertebral body, spinous process, lateral mass, or facet joints, with C7 being most commonly involved (Table I). None of these patients was involved in compensation claims.

**Group 2.** These were 20 patients with unstable cervical fractures who had required surgical fixation. Fourteen (70%) had suffered fracture-dislocations, most commonly at the C6/C7 junction while the remainder had burst or teardrop fractures associated with pedicle or laminar fractures of the lower vertebrae (Table II). Three patients had fractures of more than one vertebra.

**Group 3.** In this group were 20 patients with whiplash injuries who were seeking compensation and had been interviewed for medicolegal purposes.

**Group 4.** These were 20 patients with whiplash injuries who had never been involved in litigation or had previously settled legal claims. They were derived from patients attending fracture clinics for problems other than neck injury. We questioned 300 consecutive patients.
about a previous neck injury, of whom 85 recalled a whiplash problem. Claims had been settled by 53 patients whilst 32 had never sought compensation. All the patients in the two groups with whiplash injuries had been involved in rear-end or rear/side-impact motor-vehicle accidents. Radiographs taken at the time of injury were normal. The patients had been treated with analgesics and some had received physiotherapy.

The patients in groups 1 and 2 were contacted by telephone to assess symptomatology and morbidity related to their neck injury. The principal outcome measure was the neck disability index (NDI), a validated questionnaire assessing ten aspects of neck function and producing a score from zero (no symptoms) to 100 (severely disabled by neck pain).

The mechanism of injury, occupation before and after injury, and time off work were also recorded. There were no significant differences in age, gender or time from injury between the groups.

**Statistical analysis.** The NDI scores in each group had a non-Gaussian, bimodal distribution with a cluster of patients scoring very well, and a second cluster with moderate symptoms. We, therefore, used the non-parametric Friedman two-way analysis-of-variance test and the Wilcoxon matched-pairs signed-ranks test to analyse the data.

**Results**

The Friedman test showed that there was a significant difference between the median scores of the four groups (p < 0.0001). The Wilcoxon test was then performed to establish where these variations lay. The median NDI score for both the group with stable cervical fractures (9/100) and those with unstable cervical fractures (6/100) was significantly lower (p = 0.0003 and p = 0.0004 respectively) than that for the group with whiplash seeking litigation (27/100) (Fig. 1). The median score for the non-litigating group (14/100) was also significantly less than that for the litigating whiplash group (p = 0.0006). There were no statistical differences between the median scores of the two fracture groups and the non-litigating whiplash group (p > 0.05).

All the patients in the group with stable fractures returned to their pre-injury occupation after a median of ten weeks (interquartile range 6 to 15), except for a 59-year-old scaffolder who took early retirement. Of those with unstable fractures 85% returned to their previous jobs after a median period of 16 weeks (interquartile range 12 to 26). By contrast, the whiplash patients were off work for a median of 14 days, with 93% returning to their former occupations. There was no statistical difference in the time off work between those whiplash patients pursuing litigation and those who were not.

**Discussion**

Our results clearly show that patients pursuing compensation after whiplash injury have greater disability than those
who have had a fracture of the cervical spine or those with whiplash not involved in litigation. This may be due to the pathophysiology of the injury, the treatment which they have received or psychological differences.

Patients sustaining fractures of the cervical spine are a different demographic group from those with whiplash injuries. Our cohort was 85% male compared with typical whiplash study groups which are 50% to 65% female. Procedural differences in litigation, such as post-concussional syndrome exaggerated their symptoms for financial gain. Numerous studies since then have dismissed the influence of litigation, but we found a significant difference between patients pursuing compensation and those who were not.

Our study suggests that either patients with the most severe whiplash injuries seek litigation or that the process of litigation reinforces symptoms. Necks with a fracture undoubtedly sustained more severe physical injury which further reinforced that there is a psychological component of disability of the neck after a whiplash injury.

Any response to treatment depends on the severity of the injury. Significant ligamentous injury responds best to immobilisation while a simple muscular sprain benefits from early mobilisation.


Physical injury. Many studies have found evidence of structural damage after whiplash injury. Davis et al showed that some patients have myelopathy and/or multiple fractures of the cervical spine. Half of the patients had acute herniation of a cervical disc causing impingement of the cord. Jonsson et al found that 20% of patients had protrusion of a cervical disc of grade 3 or grade 4 on MRI which correlated with neurological findings after whiplash injury. Hamer et al found that the incidence of previous whiplash injury in patients undergoing anterior cervical disectomy was twice that of the normal population. Two studies have reported that seemingly innocent ankle sprains can cause significant long-term pain and disability. By analogy, whiplash may result in a higher degree of morbidity than may be expected from a soft-tissue injury. We acknowledge that the patients in the litigation group may have sustained more severe injuries than those who did not sue or who had settled claims quickly.

Treatment. The standard treatment of stable fractures of the cervical spine is immobilisation in a stiff collar for eight to 12 weeks. Patients who had operative fixation followed a similar regime. Early mobilisation, and the administration of non-steroidal anti-inflammatory drugs, have been shown to be the optimal treatment for whiplash injuries.

The patients with fractures did not suffer undue stiffness or weakness at the end of treatment, and made rapid recoveries with fewer long-term problems than the patients with whiplash. Gurumoorthy, Twomey and Batalin found that immobilisation in a cervical brace for four weeks followed by a defined exercise regime was more effective than early mobilisation for whiplash injuries.


References


No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.