SOFT-TISSUE INJURIES OF THE CERVICAL SPINE

15-YEAR FOLLOW-UP

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Forty patients with a whiplash injury who had been reviewed previously 2 and 10 years after injury were assessed again after a mean of 15.5 years by physical examination, pain and psychometric testing. Twenty-eight (70%) continued to complain of symptoms referable to the original accident. Neck pain was the commonest, but low-back pain was present in half. Women and older patients had a worse outcome. Radiating pain was more common in those with severe symptoms.

Evidence of psychological disturbance was seen in 52% of patients with symptoms. Between 10 and 15 years after the accident 18% of the patients had improved whereas 28% had deteriorated.


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PATIENTS AND METHODS

From a group of 61 patients who had presented to the Accident and Emergency Department of Bristol Royal Infirmary after soft-tissue injury to the neck sustained in a road-traffic accident 40 were available for follow-up. The original accident had been a rear-end vehicle collision in 90% of the patients. This group has already been reviewed after two and ten years (Norris and Watt 1983; Gargan and Bannister 1990) and the mean follow-up in the latest study was 15.5 years (14 to 17).

The patients were questioned about symptoms, the severity of which was classified according to Gargan and Bannister (1990) (Table I). We assessed the range of movement in the neck and performed a neurological examination. Radiological examination of the cervical spine was not carried out but the results of radiographs taken at a mean of 11 years after injury (Watkinson, Gargan and Bannister 1991) were correlated with clinical outcome after 15.5 years. The patients completed a McGill pain questionnaire (Melzack 1975) and scored their pain on a visual analogue scale (Huskisson 1974). A pain map was completed (Marcholes 1983). Psychometric assessment included the General Health Questionnaire (GHQ) (Goldberg and Hillier 1979), the Hospital Anxiety and Depression Scale (HAD) (Zigmond and Snaith 1983) and the Beck Depression Inventory (BDI) (Beck et al 1961). Psychological disturbance was recorded if the abbreviated score of the GHQ was greater than 5. Anxiety was considered ‘borderline’ if the anxiety subscale of the HAD was 8 to 10 and ‘definite’ if more than 11. Depression was ‘borderline’ if the depression subscale of the HAD was 8 to 10 or the Beck index was 9 to 13, and ‘definite’ if the HAD subscale was more than 11 or the Beck index was greater than 14.

Statistical analysis. We analysed the data by the chi-
squared test with Yates’ correction, Fisher’s exact test and two-tailed t-tests.

RESULTS

Severity of symptoms. At follow-up, 12 (30%) patients were asymptomatic (group A), 11 (27.5%) had mild symptoms (group B), 13 (32.5%) complained of intrusive symptoms (group C), and 4 (10%) were unable to work and relied heavily on analgesics or alternative therapy (group D). Neck pain was present in 26 (65%), and low-back pain in 12 (48%) (Table II). The average age at the time of injury in the symptomatic group was 40.7 years compared with 30.7 years in the asymptomatic group (p < 0.01); 80% of women and 50% of men continued to have symptoms.

Physical examination. We were able to examine 37 of the 40 patients; one declined and two had moved abroad. Patients with symptoms had stiffer necks. Paraesthesia occurred in 14 patients and was intermittent in 12. Two patients with constant paraesthesia had the clinical signs of the carpal tunnel syndrome. Of the 12 with intermittent paraesthesia, ten had no objective signs, one had a weak grip and one a diminished triceps reflex.

Pain. On the McGill questionnaire, 24% of patients rated their pain as ‘mild’, 52% as ‘moderate’ and 24% as ‘severe’. On a visual analogue scale of 100, the mean score in group B was 55, in group C 63 and in group D 66. Pain was intermittent in two-thirds and affected sleep in one quarter.

Pain maps showed two distinct distributions, ‘central’ with location in the neck alone and ‘radiating’ in which the pain radiated to the upper limbs (Fig. 1). Radiating pain was eight times more common in groups C and D than in group B (p = 0.01).

Psychometric testing. One patient refused testing but in the remainder anxiety or ‘borderline’ anxiety was present in 41%. In group A 16% were anxious; this figure rose to 36% in group B, 58% in group C and 75% in group D. The GHQ test detected psychological abnormality in 25% of the asymptomatic group compared with 37% of the patients with symptoms. Depression or ‘borderline’ depression was detected in 8% of the asymptomatic compared with 15% of the symptomatic group. Of the 11 patients whose symptoms had deteriorated over the past five years, 73% had anxiety or ‘borderline’ anxiety compared with 28% of those whose symptoms had stayed the same or had improved. Depression or ‘borderline’ depression was present in 36% of those who had deteriorated compared with 7% of those who had stayed the same or had improved.

Litigation. Twenty-four patients (60%) had been involved in litigation. All of these cases had been settled at a mean of

| Table II. Severity of symptoms by percentage at ten and 15 years |
|---------------------------------|------|------|
| Symptoms            | 10 yr | 15 yr |
| Neck pain           | 74    | 65    |
| Paraesthesia        | 45    | 32.5  |
| Back pain           | 42    | 48    |
| Headache            | 33    | 20    |
| Dizziness           | 19    | 10    |
| Tinnitus            | 14    | 28    |
14 years before this review, usually for small amounts.  
**Change in symptoms over the preceding five years.** Symptoms had remained static in 54%, improved in 18% and deteriorated in 28%. The patients who had deteriorated were on average five years older than the rest of the group. Seven of the 11 had taken legal action which had been settled for a mean of £2600 ($4000) at two years after initial injury.  
Radiological examination of the cervical spine performed four years previously (Watkinson et al 1991) showed that at that time 80% of the patients who had deteriorated in the last five years had degenerative changes, compared with 67% of those whose symptoms had stayed the same and 50% of those who had improved (Table III).  
Of patients who were symptomatic, 60% had not seen a doctor in the previous five years, mostly stating that they felt that doctors had nothing to offer them. Over one-third of the symptomatic group had sought alternative treatment including osteopathy, chiropractic, acupuncture, physiotherapy, aromatherapy, touch therapy and faith healing, which had been similarly ineffective. Seven patients (18%) had taken early retirement due to health problems which they related to the whiplash injury.  
**Surgery.** Two patients had undergone operation on the cervical spine. Both had suffered from myelopathy and radiculopathy. One had a C3 to C5 anterior interbody fusion with anterolateral foraminotomies which resulted in complete relief of his symptoms. The second had a C5 to C6 anterior interbody fusion. She had diabetes mellitus and a history of depression. The authors wish to thank Mr G. Langkamer for the artwork used in Figure 1.  
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.

**REFERENCES**


**DISCUSSION**

In our series 70% of the patients still had symptoms 15 years after a whiplash injury. Although some (18%) had improved over the last five years, a greater number (28%) had deteriorated. Older patients were more likely to continue to experience symptoms, and only 5% of those who were aged over 40 years at the time of the accident were free from symptoms at follow-up. Our finding that symptoms did not improve after settlement of litigation is consistent with the published literature (Balla and Moraitis 1970; Mendelson 1982).  
The pain maps reinforced the view of Hohl (1974) that radiating pain is associated with more severe disability. The distribution of the pain conforms more closely to radiation from the facet joints (Bogduk and Marsland 1988) rather than dermatomes. The maps fall into two distinct patterns and help to discriminate between mild and intrusive symptoms. The radiating pattern was much more common in patients with intrusive or severe symptoms.  
Although there was a trend towards stiffer necks in more patients with more symptoms the degree of stiffness did not discriminate between grades of disability.

<table>
<thead>
<tr>
<th>Symptoms at 15 yr</th>
<th>Radiological evidence of cervical spine degeneration at 11 yr</th>
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<tbody>
<tr>
<td>A (n = 12)</td>
<td>4 33</td>
</tr>
<tr>
<td>B (n = 9)</td>
<td>7 78</td>
</tr>
<tr>
<td>C (n = 13)</td>
<td>10 77</td>
</tr>
<tr>
<td>D (n = 4)</td>
<td>4 100</td>
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</table>

Radanov et al (1991) noted disturbances of memory and attention span after whiplash injuries in patients with symptoms. Gargan, Bannister and Main (1992) found that patients were psychologically normal at the time of injury, but if symptoms persisted for three months they developed an abnormal GHQ score. Our study shows an abnormal psychological profile in patients with symptoms after 15 years suggesting that this is both reactive to physical pain and persistent.