

## Occasional review

# Whiplash injury: a reappraisal

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**SUMMARY** Few topics provoke so much controversy or heated opinion, based on so little fact as whiplash injuries. In emergency departments, orthopaedic, neurological and rheumatological clinics, and not least in the Courts, this common syndrome is shrouded in mystery and creates clinical insecurity in those who attempt to explain its mechanism, its prognosis and treatment. These problems are compounded in medico-legal practice where the potential rewards of successful litigation may colour the clinical picture.

### Methods

This paper is essentially a selective review which attempts to appraise and assemble some of the facts and fallacies available and includes a series of 100 consecutive medico-legal cases (results marked in parentheses).

**Definition** No acceptable definition exists, but few would dissent from the open-ended one: "a collection of symptoms following injury to the neck, usually hyperextension-flexion, often the result of a car accident".<sup>1</sup> Traumatic disc protrusions and damage to cord and nerve roots are usually pathologically and clinically distinctive, with segmental root or long tract signs. They should be *excluded by definition*, since they only serve to broaden the spectrum and muddy already turbid waters.

**Mechanisms** A flexion-extension movement is the usual force, but torsional components can apply. Rapid deceleration in the primate neck produces more of a concertina pattern and in a car much depends on the initial posture of the neck. Any sudden unanticipated movement prevents the normal reflex, protective, bracing or splinting of neck muscles and can cause this type of injury. It is agreed that the essential cause is a postulated mechanical strain with or without contusion of ligaments and muscles supporting the bony cervical spine. The classic example is the rear impact into a stationary vehicle but other directions can produce similar clinical effects. A

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review of 2 352 cases reported to the Motor Accidents Board in Victoria (MAB)<sup>2</sup> are shown in table 1.

### Acute whiplash syndrome

The initial symptoms in a prospective analysis by Balla of 190 cases reported<sup>2</sup> to the MAB, and the present material (100 patients) are shown in Table 2.

**Sex** In Balla's series of 190 patients the Male:Female ratio was 34.7% to 65.3%. In the present series of 100 patients the Male:Female ratio is similar: 29% to 71%. In contrast, for all other injuries reported to the MAB the ratio was 55.6% to 44.4% in 30 139 subjects. In another series, Hohl confirms a marked female predominance,<sup>3,4</sup> which is remarkable since almost all other injuries are more common in men.

**Age distribution** (Table 3) This is also unusual, and the condition is rare in the younger and older age groups when compared to accident victims in general.<sup>2</sup>

Table 1 *Type of injury*

	Balla (300 patients)	Present series (100 patients)
Rear end collision	42.6%	56%
Head on	32.1%	26%
Side-on or other	35.3%	18%

Table 2 *Clinical features at onset*

Symptoms	Balla	Present series
Headache	75.5%	52%
Neckache	90%	100%
Limited neck movement	50%	37%

Table 3 Age of patients with whiplash compared to other injuries

Age	Whiplash Balla	Present series	Other accidents (MAB)
< 21	16.8%	9%	29.8%
21-60	81.2%	87%	60.5%
> 60	2.0%	4%	9.7%

### Prognosis

Here there is great divergence of opinion. At one month "half were improving and 75% back at work".<sup>2</sup> In 62 of the present 100 cases pain had improved and analgesics were stopped at one month. At 12 wks 2/3 cases were pain free (71% in the present series); 1/3 cases had pain more than 50% of the time.<sup>2</sup>

This supports Edmead's statement<sup>5</sup> that "Most people who suffer this injury have neck and head pain that clear within a few days or weeks; the likely explanation is a simple sprain of neck muscles and ligaments."

### Late whiplash syndrome

Definition: patients symptomatic after six months. The symptoms in such cases are similar in most series, (table 4).

The overall similarity is evident, but cultural differences and methods of eliciting symptoms do provide disparities, notably in headache and depression. Since many of these symptoms are seen in the "post-traumatic syndrome" after head injuries not involving the neck, and indeed, after other accidents with no physical injuries,<sup>6</sup> a simplistic mechanical explanation of the symptoms is fraught with danger.

**Examination** Most observers make no specific comment on the physical signs, except to mention limited neck movements. This finding was invariable in this series. Grimacing and grunting to indicate pain on active movement was present in 88 subjects. Spurious weakness of grip (tremulous, variable and with the wrist held in extension to restrict the power) was present in 55 subjects. Non-anatomical sensory loss was seen in 35 patients, in 12 of them it extended from all the fingers to the shoulder tip and involved all modalities.

Table 4 Symptoms in late whiplash syndrome

Balla	Present series
Neckache	98%
Headache	97%
Neck stiff	85%
Arm pain	39%
Anxiety	63%
Irritable	57%
Depression	50%
Insomnia	47%
"Dizziness"	?

Preceding cervical spondylosis is seen by some as a factor predisposing to either the occurrence of symptoms or to their prolongation. Radiological abnormalities include disc space narrowing and posterior osteophyte formation with encroachment of the foramina. Correlation coefficients (*r* values)<sup>2</sup> of neck radiographs with head, neck and arm symptoms are however, poor.

	Headache	neckache	neck-stiff	arm-ache
Abnormal radiographs	0.064	.0.133	0.144	0.117

This strongly suggests that those with initial radiographic changes, that is, those with preceding spondylosis, have no greater propensity for these symptoms than those without antecedent radiological spondylosis.

### Prognosis

At six months 74% of 5000 cases were able to return to normal activities.<sup>2</sup> In our series, 89% were back at normal work at six months, but 18% still had discomfort or pain and took intermittent or regular analgesics. At one year these figures were 94% and 15% showing only a small further improvement (see table 5).

Similarly, Deans *et al*<sup>7</sup> found pain ceased in 49% at three months. At one year 58% were pain free, 36% had occasional pain. Only 6% (5/85) had constant pain at one year.

Norris<sup>8</sup> at follow up (19 to 24 months) related signs at presentation to subsequent disability (table 6).

Variation in different series, possibly reflecting different non-comparable material and a different personal approach to complainants, is shown by Hohl who found that 45% of 266 patients continued to suffer symptoms two years following final settlement of litigation.<sup>3,4</sup>

Physical evidence of nerve root or cord injury did not materialise after uncomplicated whiplash injury but was present at the onset in a few victims due to antecedent spondylosis. There is some evidence that any pre-existing cervical spondylosis may prolong symptoms.<sup>8</sup> After legal settlement, improvement had occurred in 50% of those with no initial root signs, but in a smaller proportion of those with root signs. This is

Table 5 Prognosis—present series (100 patients)

	1 month	3 months	6 months	1 year
Pain free	62%	71%	82%	85%
Working	79%	86%	91%	94%

Table 6 Effect of initial signs on prognosis (from Norris)

At presentation no of patients	No signs	Stiff neck† nil CNS 24	Stiff neck† root signs 10
Pain ceased	56%	19%	10%
Return to work	2.4 wks	4.7 wks	10.3 wks

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not to say that whiplash injuries affect spondylosis, for, despite much contention there is a dearth of objective evidence that spondylosis is either accelerated or worsened by the injury.

**Conclusions***Fact*

1 There is no adequate published control group, that is, a series of whiplash injury occurring outside the context of a compensation claim.

2 No good radiographic or laboratory test exists to confirm or refute the symptoms or disorder.

3 Predominance in females contrasts with all other injuries: is it related to threshold or the reasons for which they complain? If a greater proportion of males receiving whiplash injuries fail to report them or to initiate litigation proceedings, this might explain the apparent disparity in sex incidence.

4 Relative sparing of the younger and over 60's age groups and very poor correlation with radiographic evidence of spondylosis indicate that symptoms are not in the main, dependent on degenerative changes in the cervical spine.

5 The majority of subjects recover quickly, two thirds being pain free at three months, and/or with pain that does not prevent a return to work at one month in 74%. The striking resemblance to "strains" of other muscles and ligaments is apparent.

6 There is a high association with anxiety and depression.<sup>2</sup> Spurious non-anatomical physical signs are common and reflect an exaggerated or simulated illness. Analgesics and collars fail to produce relief in those with "late whiplash" symptoms. Settlement of litigation sometimes, results in a resolution of complaints.

*Opinion*

There is a paucity of evidence to suggest that whiplash injury is *per se* any different from other muscular or ligamentous strains or sprains in the trunk or limbs.

The outstanding and differentiating features include: the unexplained high incidence in women; the prolonged nature of symptoms and apparent disability in a significant if small subgroup of patients; the common attendant symptoms of anxiety, fatigue, irritability; unlike other physical sequelae of trauma, immobilisation (collar) and analgesics are useless, in published series; most sufferers are involved in compensation claims.

Although no control group exists, the natural evolution of symptoms is not known. Whether the attendant symptoms are "genuine" or exaggerated in the interests of enhancing financial rewards is a subjective judgement. Balla<sup>2</sup> states that "Socio-cultural factors may account for a number becoming chronic. It is difficult to separate the effects of seeking compensation from other factors. Whiplash injuries certainly lend themselves to fraud of which there have been a number of well documented cases seen at the Motor Accidents Board."

So-called "ambulance-chasing" is well known in North America, and regrettably whiplash is one of the better known complaints which is easy to simulate and hard to totally disprove. Despite this, it is a genuine if not serious injury and disability may be prolonged by the lengthy delay in obtaining a final settlement. Neurotic features can themselves be deliberately inflated, appearing to be disproportionate to the consequences of injury, and should be carefully weighed in relationship to the circumstances, previous psychoneurotic illness and to current behaviour and observed reactions during the medical examination. Although they are easily simulated and indeed may be engendered by Trades Unions and lawyers, in certain instances they genuinely enhance and extend pain and suffering.

Most victims of whiplash injury have, however, sustained no more than a minor sprain to the soft tissues and unusually severe or protracted complaints may demand explanations which lie outside the fields of organic and psychiatric illness.

**References**

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**Addendum:**

Since writing this paper, Maimario commented<sup>1</sup> on my note in the British Medical Journal<sup>2</sup> on this work and has reported MRI in four patients with moderate or severe persisting symptoms; he notes that Rofo had examined 15 similar patients.<sup>3</sup> MRI was normal in all 19 cases.

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- 3 Rofo NMR. Tomography of the cervical spine. *Fortschr Roengenstr* 1986;**145**:657-60.