

# **The Prognosis Of Neck Injuries Resulting From Rear-end Vehicle Collisions**

**The Journal Of Bone And Joint Surgery (British)**

**November 1983, Vol. 65-B. No. 5**

S. H. Norris, I. Watt

FROM ABSTRACT

Injury of the neck may result when a motor vehicle is run into from behind; such injury is frequently the cause of prolonged disability and litigation.

We report a series of 61 patients with these injuries.

A classification, based upon the presenting symptoms and physical signs has been evolved.

This classification is shown to be a reliable basis for formulating a prognosis.

Factors which adversely affect prognosis include the presence of objective neurological signs, stiffness of the neck, [loss of cervical lordosis], and pre-existing degenerative spondylosis.

THESE AUTHORS ALSO NOTE:

"Acute neck injuries resulting from road traffic accidents are common and are frequently the cause of prolonged disability and of litigation."

"There is, as yet, no simple method of estimating prognosis at, or soon after, the time of injury."

All patients in this study had been in a vehicle involved in a rear-end collision.

The standard series of three radiographs of the cervical spine was supplemented by flexion and extension views in the lateral projection.

Details of the accident, including where the patient was sitting, whether a seat-belt or a head restraint was used, and whether the vehicle was moving or stationary at the moment of impact, was collected.

"Any delay between the accident and the onset of symptoms was noted as were complaints of headache, dysphagia, visual or auditory symptoms, pains in the arm, paraesthesiae, weakness or dizziness, in addition to neck pain."

In this study, patients were placed into one of three groups based upon their signs and symptoms.

Group 1: These patients had symptoms related to their injuries but no abnormality on physical examination.

Group 2: These patients had symptoms and a reduced range of movement of the cervical spine but no abnormal neurological signs.

Group 3: These patients had symptoms, a reduced range of cervical movement and evidence of objective neurological loss.

INITIAL = symptoms at first evaluation, within 7 days of injury.

END = symptoms at final evaluation, a minimum of 6 months following injury.

|              | <u>Percentage of Patients</u> |     |         |     |         |     |
|--------------|-------------------------------|-----|---------|-----|---------|-----|
|              | Group 1                       |     | Group 2 |     | Group 3 |     |
|              | INITIAL                       | END | INITIAL | END | INITIAL | END |
| SYMPTOMS     |                               |     |         |     |         |     |
| Neck pain    | 100                           | 44  | 100     | 81  | 100     | 90  |
| Headache     | 48                            | 37  | 78      | 37  | 80      | 70  |
| Dysphagia    | 19                            | 0   | 10      | 0   | 30      | 0   |
| Paraesthesia | 33                            | 37  | 43      | 29  | 100     | 60  |
| Weakness     | 15                            | 0   | 10      | 0   | 50      | 0   |
| Visual sym   | 8                             | 19  | 0       | 10  | 30      | 10  |
| Auditory s   | 8                             | 11  | 0       | 14  | 30      | 20  |
| Dizziness    | 0                             | 0   | 5       | 0   | 10      | 0   |

[IMPORTANT OBSERVATIONS:

1) Patients with normal physical examinations (group 1) can still have neck pain, headache, dysphagia, subjective paresthesias, subjective weakness, visual and auditory symptoms.

2) The least objectively injured patients (groups 1 and 2) develop more visual and auditory symptoms in the 6 months following whiplash injury.

3) 44% of the least injured patients (group 1) have continued neck pain 6 months after whiplash injury.

4) 90% of the most injured patients (group 3) have continued neck pain 6 months after whiplash injury.]

Specific attention was paid to the curve of the cervical spine (percentages):

|          | Group I | Group 2 | Group 3 |
|----------|---------|---------|---------|
| Lordotic | 74%     | 42%     | 30%     |
| Kyphotic | 7%      | 13%     | 10%     |
| Straight | 19%     | 46%     | 60%     |

[IMPORTANT OBSERVATIONS:

Post-whiplash injury loss of cervical lordosis is associated with more objective findings, neurological injury, and a worse prognosis for recovery.]

## RESULTS

All 61 patients in this study complained of neck pain and stiffness.

Occipital headache was the second most common symptom.

"Subjective paraesthesiae was suffered by all the patients in Group 3 [neurological loss] but by less than half of those in Groups 1 [no objective findings] and 2 [reduced cervical ROM]."

The wearing of seat-belts, using head restraints, whether or not the car was stationary when hit, and where the patient was sitting did not significantly influenced the severity of the neck injury.

"The position the patient occupied in the car did not affect the severity of the neck injury."

20% of patients in each group with persisting neck pain found that the pain was sufficiently severe to cause regular time off work. **[IMPORTANT]**

70% of patients in the neurological loss group (group 3) complained that the pain was severe enough to interfere with hobbies or recreational activities whereas only 25% were similarly affected in the no objective findings group (group 1). **[IMPORTANT]**

"There was no statistical difference between the groups in the improvement of the symptoms after settlement [of compensation claim]."

“Entirely normal radiographs were found in 30% of patients in Group 1 [no objective findings] and 13% of patients in Group 2 [reduced cervical ROM]; all radiographs in Group 3 [neurological loss] were abnormal.” **[IMPORTANT: this indicates that radiographic findings have prognostic value]**

“Degenerative spondylosis was detected in 26% of patients in Group 1 [no objective findings], 33% in Group 2 [reduced cervical ROM], and 40% in Group 3 [neurological loss].” **[IMPORTANT: this indicates that degenerative changes are associated with greater injury and worse prognosis]**

X-rays showed no patients suffered from dislocation or ligamentous instability.

## DISCUSSION

These authors concluded that accurate estimation of the speed of impact was not possible and that it is not possible to estimate the distance that the patient’s vehicle has been pushed forward.

In this study, “patients with objective neurological signs clearly had a poorer prognosis than patients without such signs.”

“Time off work after the injury and persistence of neck pain and headache of sufficient severity to affect hobbies and recreation were all more common in Group 3 [neurological loss].”

“All patients in Group 3 with neurological signs pursued legal claims compared with only approximately half of those in Group 1 [no objective findings]; this suggests that litigation does depend upon the severity of injury since it is unlikely that a ‘compensation neurosis’ could have developed within seven days of the accident.” **[Very Important]**

In all groups, the patients with persistent symptoms were the most likely to pursue legal claims.

“Litigation per se has little influence on symptoms.”

Patients with mild initial symptoms are less likely to make a litigation claim.

Patients with mild initial symptoms who do make a litigation claim are still likely to continue to improve. **[Important]**

Patients with the most severe initial symptoms are less likely to improve, and some deteriorate after settlement of their compensation claims.

This “study suggests that prognosis is predictable on the basis of the initial presentation of the patient.”

“Two features on plain radiographs seem relevant.”

- 1) “Pre-existing degenerative changes in the cervical spine, no matter how slight, do appear to affect the prognosis adversely.”
- 2) Abnormal curves in the cervical spine “are more common in patients with a poor outcome.”

“The prognosis may be modified by the presence or absence of degenerative changes, by an abnormality [degeneration] of the cervical spine on the initial radiograph, or by both.”

#### KEY POINTS FROM DAN MURPHY

- 1) Neck injury from motor vehicle collisions frequently cause prolonged disability.
- 2) Motor vehicle collision injured patients routinely suffer from neck pain, neck stiffness, headache, dysphagia, visual symptoms, auditory symptoms, arm pain, arm paraesthesiae, weakness, and dizziness.
- 3) Patients with normal physical examinations can still have neck pain, headache, dysphagia, subjective paresthesias, subjective weakness, visual and auditory symptoms.
- 4) The least objectively injured patients develop more visual and auditory symptoms in the 6 months following whiplash injury than immediately after being injured.
- 5) 44% of the least injured patients (no objective findings) have continued neck pain 6 months after whiplash injury.
- 6) 90% of the most injured patients (neurological loss) have continued neck pain 6 months after whiplash injury.
- 7) Post-whiplash injury loss of cervical lordosis is associated with more objective findings, more neurological injury, and a worse prognosis for recovery.
- 8) The most common whiplash injury complaint is neck pain and stiffness.
- 9) Occipital headache was the second most common whiplash symptom.
- 10) The wearing of seat-belts, using head restraints, whether or not the car was stationary when hit, and where the patient was sitting did not significantly influence the severity of the neck injury or its prognostic outcome.

- 11) 20% of whiplash-injured patients found that persisting neck pain was sufficiently severe to cause regular time off work. **[IMPORTANT]**
- 12) 70% of whiplash-injured patients with neurological loss had pain severe enough to interfere with hobbies or recreational activities. **[IMPORTANT]**
- 13) Abnormal cervical x-rays (loss of cervical lordosis and/or degenerative changes) are significantly associated with greater injury and a poor prognosis for recovery.
- 14) Based upon police reports, it is not possible to accurately estimate the speed of impact or the distance that the patient's vehicle had been pushed forward.
- 15) "Patients with objective neurological signs clearly had a poorer prognosis than patients without such signs."
- 16) The more severely injured a patient is, the more likely they will initiate a legal claim, and the initiation of legal claims is not related to 'compensation neurosis'.
- 17) The patients with persistent symptoms are the most likely to pursue legal claims.
- 18) Litigation has little influence on symptoms.
- 19) This "study suggests that prognosis is predictable on the basis of the initial presentation of the patient."
- 20) "Pre-existing degenerative changes in the cervical spine, no matter how slight, do appear to affect the prognosis adversely."
- 21) Loss of cervical lordosis is coupled with a poor prognostic outcome.
- 22) Degenerative changes on initial x-rays are coupled with a poor prognostic outcome.