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Whiplash injuries in Finland: A prospective 1-year follow-up study

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ABSTRACT

Objectives

The aim of the study was to define how many whiplash injuries occur in Finland in traffic accidents and the degree of severity of these injuries using the whiplash-associated disorders (WAD) classification presented by the Quebec Task Force, and to define possible long-term health effects caused by whiplash injury as well as the duration of whiplash-associated sick-leaves.

Methods

This was a prospective one-year-follow-up study. Fourteen insurance companies paying compensations for traffic accidents in Finland sent the accident reports and medical certificates of all neck injuries attributable to traffic accidents to the research team. The material was collected from neck injuries that had occurred in traffic accidents during the year 1998.

Results

The majority of those suffering a whiplash injury were women. On the basis of the WAD classification, most whiplash injuries were mild, belonging to grades WAD I and II. At one year from the accident nearly 10% considered that their health had been impaired significantly as a result of their neck injury. Over 10% of those questioned had been on sick-leave for over a month but only 1.5% had been on sick-leave associated with the injury for more than 6 months. The most common symptom after one year was neck pain or neck pain combined with headache and symptoms in the upper extremities. No major changes related to the seasons of the year were found.

Conclusions

The number of reported neck injuries in proportion to all traffic accidents involving physical injuries is small, even in proportion to rear-end collisions. In a considerable proportion of collision patients, whiplash injury does result in significant impairment which can last as long as a year after the accident. The WAD classification predicts the duration of work disability and the long-term health damage caused by the injury. Since the appearance of symptoms and the individual need for rehabilitation due to impaired functional capacity do not depend solely on the tissue damage and biomechanical forces involved in the collision, in the future it will be important to determine which factors are responsible for the differences in coping after a collision.

Introduction

The motorization of society has led to some new health problems. Recently, whiplash-type injuries occuring in traffic accidents, especially the long-lasting symptoms associated with these injuries, have been the focus of attention. Whiplash injuries have been widely studied because of the distinctive symptoms that they cause, the problems related to chronic pain and also because of the medicolegal implications. In recent years the number of neck injuries associated with traffic accidents has increased considerably, whereas the number of other injuries has decreased (1, 2). A Canadian work group carried out an extensive retrospective follow-up study and also a comprehensive literature survey covering the research, treatment and prognosis of whiplash injuries (3). This work group defined the term whiplash-associated disorders (WAD) as a clinical entity describing the symptoms related to a whiplash injury and presented a classification model based on the severity of the injury (Table I).

It is generally accepted that there can be prolonged symptoms after a whiplash injury (4, 5). Estimates vary between 5% and 20% on how many symptoms are still present one year after the accident. However, there is considerable disagreement on which are the main factors responsible for the long-lasting nature of the symptoms. The significance of psychological and psychosocial factors has been considered; on the other hand, possible pathoanatomical damage to the spine causing the prolonged symptoms have been proposed (6-9). It has also been claimed that prolonged symptoms after a whiplash injury can vary depending on the way that compensation is paid by insurance companies. There also seems to be variation between different countries due to social and cultural differences (10-12).

Table I. Clinical classification of Whiplash-Associated Disorders by the Quebec Task Force.

Grade	Clinical presentation
0	No complaint about the neck, no physical signs
I	Neck complaint of pain, stiffness, or tenderness No physical signs
II	Neck complaint and musculoskeletal signs *
III	Neck complaint and neurological signs **
IV	Neck complaint and fracture or dislocation

*Decreased range of motion or point tenderness. **Decreased or absent tendon reflexes, weakness, sensory deficits.

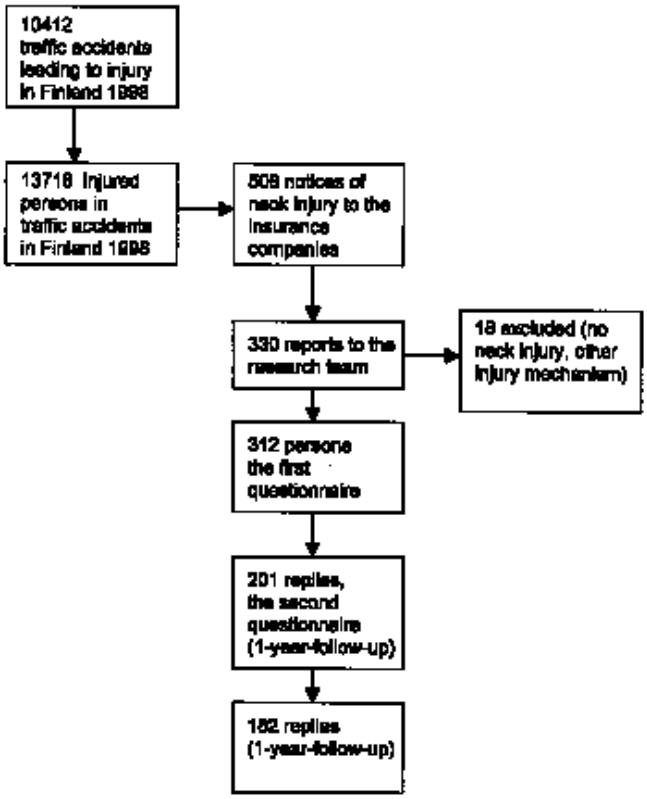

Fig. 1. The composition of the research material.

The objective of this study was to describe the neck injuries caused by traffic accidents which occurred in Finland between 1.1.1998 and 31.12.1998. The aim was to define how many neck injuries were attributable to all traffic accidents during a year, the degree of severity of these, how much work disability was associated with the injuries and the impact of the injury on the individual's state of health during a follow-up of one year.

Materials and methods

The information was gathered from all traffic accidents which occurred in Finland in 1998. After an insurance company had received notification of a traffic accident-related neck injury it requested the injured person's consent to allow his/her information to be included in the study. After obtaining the person's consent, the insurance companies sent the personal data and the medical certificate concerning the traffic accident and the injury to our research team. A WAD classification in accordance with the model of the Quebec work group (Table I) was made on the basis of the medical certificate. The statistics revealed that in 1998 in Finland there were a total of 81,335 traffic accidents. Rear-end collisions accounted for 22% of all traffic accidents. The composition of the research material is presented in Figure 1.

The 312 persons taking part in the study were sent the first inquiry forms which collected demographic data, features of the collision, and symptoms related to the subject's state of health and the injury. Information concerning state of mind, general psychic stress and cognitive processing was also gathered, using generally accepted validated health questionnaires (Beck's depression index, neck disability index, general health questionnaire). The first questionnaire was answered by 201 persons (64%). One year after the accident, a new questionnaire was sent to those who had answered the first form. The items in this new inquiry form concerned the effect of the neck injury on the condition of health compared to health status before the accident, the main symptoms after the neck injury, any physiotherapy treatment received or possible reference to a more extensive evaluation of need for rehabilitation and the duration of possible sick-leave. The follow-up questionnaire was answered by 182 persons (91%).

Results

The age and sex distribution as well as other demographic data of those who answered the first questionnaire are presented in Table II. According to the WAD classification there were 3 (1.5%) WAD 0, 194 (47.5%) WAD I, 78 (39.4%) WAD II , 22 (11.1%) WAD III and 1 (0.5%) WAD IV cases. Three cases could not be classified due to missing data. The distribution into WAD grades according to age and sex is presented in Table III.

The most common symptoms after the accident were neck and shoulder pains with 169 persons (84.1%) complaining of these symptoms. Headache was reported by 134 persons (66.7%). Symptoms in the upper extremities had been experienced by 80 persons (44.8%). Forty-seven individuals (23.4%) had experienced impairment of memory and 49 persons (24.4%) described diffi-

Table II. Sociodemographic characteristics of the accident victims.

	N	%
Gender		
Female	131	65.2%
Male	70	34.8%
Mean age years (SD)		
Female	39.3 yr.	13.5
Male	45.6 yr.	14.2
Marital status		
Single	26	12.9%
Married	129	64.2%
Widowed	6	3.0%
Divorced	25	12.4%
Unknown	15	7.5%
Education		
Primary school	92	45.8%
Secondary school	35	17.4%
High school graduate	58	28.9%
Missing	16	8.0%

culty in concentrating.

According to the follow-up study at one year, 62 persons (30.8%) reported that the traffic accident had not affected their condition of health compared to the situation before the accident, whereas 103 persons (51.2%) reported that the accident had slightly impaired their condition of health. Sixteen subjects (8.0%) felt that their condition of health had been significantly impaired because of the neck injury and one person (0.5%) declared that the neck injury had totally ruined his health. The individual symptom that was most commonly reported to most affect the health was neck pain (39 subjects; 19.4%), and it was often connected with headache, symptoms in the upper extremities and dizziness (44 cases; 21.9%). Headache was the second most common individual symptom, being reported by 16 (8.0%) individuals.

Seventy-one persons (35.3%) had been on sick-leave because of the accident, with 21 (10.4%) needing sick-leave for over a month and 6 (3%) for over 3 months. Only 3 subjects in this cohort reported having been on sick-leave for more than 6 months. The duration of sick-leaves according to the different WAD grades is presented in Table IV.

The effect of a whiplash injury on the condition of health a year after the accident in different WAD grades is presented in Table V. There was no difference between men and women in the reported change in the condition of health at one year. Seventy-seven (65.8%) women and 43 men (66.8%) reported that their health had deteriorated.

Table III. WAD-grades according to gender and age.

WAD grade	Female n (%)	Male n (%)	< 20 yr n (%)	20-40 yr n (%)	40-60 yr n (%)	> 60 yr n (%)
0	2 (1.6)	1 (1.4)	1 (9.1)	0	1 (1.1)	1 (7.1)
I	63 (49.2)	31 (44.3)	7 (63.6)	41 (47.7)	42 (48.3)	4 (28.6)
II	49 (38.3)	29 (41.4)	3 (27.3)	38 (44.2)	29 (33.3)	8 (57.1)
III	14 (10.9)	8 (11.4)	0	7 (8.1)	14 (16.1)	1 (7.1)
IV	0	1 (1.4)	0	0	1 (1.1)	0

Table IV. The length of sick-leaves in different WAD-grades.

WAD grade	0 day	1-7 days	8-30 days	31-90 days	91-180 days	181-365 days
0	2 (100.0%)					
I	57 (64.8%)	13 (14.8%)	12 (13.6%)	5 (5.7%)		1 (1.1%)
II	42 (60.9%)	10 (14.5%)	10 (14.5%)	6 (8.7%)		1 (1.4%)
III	8 (40.0%)		5 (25.0%)	4 (20.0%)	2 (10.0%)	1 (5.0%)
IV			1 (100.0%)			

Table V. The effect of a whiplash injury on the condition of health one year after the accident in different WAD-grades.

WAD grade	No change	Slightly worse than before the accident	Significantly worse than before the accident	The neck injury has totally ruined my life
0	2 (100.0%)			
I	37 (42.0%)	44 (50.0%)	7 (8.0%)	
II	19 (27.5%)	43 (62.3%)	7 (10.1%)	
III	3 (15.0%)	14 (70.0%)	2 (10.0%)	1 (5.0%)
IV		1 (100.0%)		

Discussion

This prospective follow-up study deals with the incidence of neck injuries related to traffic accidents (especially to car collisions) in Finland, the degree of severity of the neck injuries, the work disability associated these injuries and the effect of the neck injury on the condition of health at one year after the accident. All the insurance companies which pay compensation for traffic accidents in Finland sent data on traffic accident-related neck injuries to the study group. The return percentage for the first questionnaire only reached a satisfactory level (64%), but the one year follow-up form was returned by 91%.

The number of neck injuries reported to insurance companies in proportion to all injuries in traffic accidents is relatively small, a mere 3.7%. The number is significantly smaller than the general occurrence of prolonged neck trouble in the population during a year (13). Therefore, it can be presumed that in the research material consisting of collision patients, there was no overrepresentation of subjects with neck problem. Most of the neck injuries in this material were mild, representing WAD grades I and II.

Even though the type of the collision was not separately inquired into in this study, it is known from Finnish traffic accident statistics that in 1998 there

were 1999 rear-end collisions which led to physical injuries. Since the insurance companies received notice of only a total of 508 traffic accident related neck injuries, the conclusion can be drawn that only a small proportion of rear-end collisions lead to significant neck injury. Thus, it is difficult to interpret the results of a study whose material has been collected retrospectively from all rear-end collisions in a certain period of time as only a small proportion of the victims were likely to have experienced a whiplash injury and thus, they, in reality, do not constitute a relevant research material of whiplash injuries (14). In this case the difference between collision patients and the comparison cohort can already be presumed to be small.

The incidence of long-term health damage, which in nearly 10% of cases had led to a significant health impairment compared to the situation before the accident, corresponds well to the figures often mentioned in international publications (4,5). However, interestingly the situation seems different from reports from Lithuania and Greece where apparently there are very few long term symptoms related to a collision (11, 12). In the study carried out in Lithuania the research material consisted of persons who had been in a rear-end collision according to police records and on the basis of the observations made above it can be presumed that not all the persons in that study had experienced a whiplash injury. This presumption is supported by the observation made by the research team that only 47% of the victims reported pain after the accident (11).

The occurrence of symptoms after the whiplash injury also seems, at least to some extent, to be independent of the biomechanical forces involved in the collision (15). However, the individual need for rehabilitation seems to be quite independent of the tissue damage and biomechanical forces. It is accepted that a whiplash injury can cause a wide range of different symptoms. An objective of future research would be to concentrate on the association between the symptoms and the abilities of the individual to cope with the symptoms instead of concentrating on the connection between the symptoms and the primary trauma (16). There is reason to believe that this former relationship has a considerably greater influence on, for example, choosing and carrying out social and insurance decisions and rehabilitation measures. Though our subjects had a similar original etiology, from the point of rehabilitation we can see that they represent a very heterogeneous group, as was also apparent from the sick-leave statistics. Consequently, with this research material and the questionnaires that have been used, it will be possible in the future to study not only the epidemiology of whiplash injuries, as has been done in this study, but also the differences between individuals in coping after the collision.

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