

Headache in chronic acceleration injury of the cervical spine¹

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Summary

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Some people believe in cervicogenic headaches, others do not – there has been exaggeration on both sides. In the past 10 years the author studied 191 patients for evaluation by a medical expert. 104 of the patients were represented by a lawyer and 26 more were sent by court. 63 of the 191 patients were male, 128 female, so about 2 out of 3 were female. The average age of the men was 41.8 years (24–66) and of the women 37.5 (20–68). All were victims of a road accident. 129 had suffered a rear-end collision, 33 a frontal collision and 27 another type of road accident with whiplash mechanism, but without head trauma. The time elapsed since the accident was on average 4.23 years (1 to 26 years). The author presents the results of a retrospective study of these patients. 174 of the 191 suffered a new headache after the accident. This means that 91% of the whiplash victims with long-standing health problems had a new type of headache after their accident. The great majority (91%) still suffered from headaches in addition to the neck pain and other typical symptoms of whiplash injury. In 71% of those suffering from a new type of headache, the headache was already present the first day after the accident. The headache mostly irradiated from the neck to the frontal and retroorbital region, either bilaterally or mainly on one side. 124 of these 174 persons had their first headache immediately or not later than one day after the accident, 2 in the course of the first week, 9 in the course of one month following the accident and in 39 this information was not available. The characteristics of the pain, their

development with time and the treatments applied are presented. Some speculations about the pathophysiology of this type of headache are added.

Keywords: *whiplash; cervical spine; cervicogenic headache; acceleration injury; chronic whiplash syndrome*

Introduction

Headaches due to changes in the cervical spine were described 80 years ago by Barré and his pupil Liéou [1, 2]. Among other symptoms of cervical spondylosis – surprisingly resembling those seen after whiplash injuries – they also observed headaches. The monograph, published in German in 1949 by Bärtschi-Rochaix from Berne, was entitled “Migraine cervicale” [3]. The headache cases he presented were all in patients who had a cervical spondylosis and who had suffered some sort of trauma to these structures. In 1968 he summarised his views in 1968 in the *Handbook of Clinical Neurology* [4]. Sjaastad et al. defined precisely which circumstances and which characteristics had to be fulfilled in order to accept a headache to be cervicogenic [5, 6]. The features indicating cervical abnormality necessary to attribute the headache to a cervical cause are listed in table 1 (from 5). In the first classification of headache disorders by the International Headache Society (IHS) in 1988, the specific term of headache due to whiplash injury was not explicitly mentioned [8]. It had to be included in chapter 11.2.1 “Cervical Spine” (table 2). The second edition, published in January 2004 [9], defines the cervicogenic headache (chapter 11.2.1) (table 3) and also lists acute (and chronic) headache attributed to whiplash injury (5.3 and 5.4) (tables 4a and 4b). One could therefore argue that cervicogenic headache has now been formally accepted by the community of the world’s most respected headache specialists. If, however, one looks more carefully at the conditions they formulated

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Table 1 Features indicative of cervical abnormality (from [7]).

I	tenderness, neck muscles
	a) trapezius muscle, mainly upper part
	b) neck muscles (splenius)
	c) sternocleidomastoid muscle (upper/middle part)
II	tenderness over nerves/tendons in the neck/occiput*
	a) greater occipital nerve (GON)
	b) minor occipital nerve (MON)
	c) "groove behind mastoid process"
	d) "bony area", medial to mastoid process
	e) "posterior neck tendons"
III	tenderness, facet joints
	a) upper ones
	b) middle ones
	c) lower ones
IV	range of motion in the neck (ROM)*
	rotation
V	skin-roll test**
	a) skin-fold thickness (in mm)
	b) tenderness

* Part of the diagnostic system for cervicogenic headache.

** In the shoulder area.

A comparison of the symptomatic and non-symptomatic side is always carried out.

Table 2 IHS Classification from 1988.
Headache ... associated with disorders of ... neck ...

11.2.1 Cervical spine

Diagnostic criteria:

- | | |
|---|--|
| A | Pain localised to neck and occipital region. May project to forehead, orbital region, temples, vertex or ears. |
| B | Pain is precipitated or aggravated by special neck movements or sustained neck posture. |
| C | At least one of the following: (1–3). |
| D | Radiological examination reveals at least one of the following: (1–3). |

Comment:

... disorder may be located in the joints of ligaments ...

Table 3 IHS Classification from 2004.

11.2.1 Cervicogenic headache

- | | |
|---|--|
| A | Pain, referred from a source in the neck and perceived on one or more regions of the head and/or face, fulfilling criteria C and D. |
| B | Clinical, laboratory and/or imaging evidence of a disorder or lesion within the cervical spine or soft tissues of the neck known to be, or generally accepted as, a valid cause of headache (1). |

(1) ... cervical spondylosis and osteochondritis are NOT accepted as valid causes fulfilling criterion B ...

Table 4a
IHS Classification from 2004.

5.3 Acute headache attributed to whiplash injury

- | | |
|---|---|
| A | headache, no typical characteristics known, fulfilling criteria C and D |
| B | history of whiplash ... |
| C | headache develops within 7 days ... |
| D | 1. ... resolves within 3 months after whiplash ... |

Table 4b
IHS Classification from 2004.

5.4 Chronic headache attributed to whiplash injury

- | | |
|---|---|
| A | headache, no typical characteristics known, fulfilling criteria C and D |
| B | history of whiplash ... |
| C | headache develops within 7 days ... |
| D | persists for >3 months after whiplash |

Comment:

... there is no good evidence that ongoing litigation, with settlement pending, is associated with prolongation of headache. It is important to assess patients carefully who may be malingering and/or seeking enhanced compensation.

for the diagnosis, there are so many conditions to be fulfilled and so many reservations put forward that one wonders whether the International Headache Society really believes in cervicogenic headache. Even more doubts are put forward in the acceptance of the acute (chapter 5.3) and chronic (chapter 5.4) headache attributed to whiplash injury. Already the term of the general title indicates scepticism: the headache is not due but simply "attributed" to whiplash. They also put forward serious doubts: "It is important to assess patients carefully who may be malingering or are seeking enhanced compensation."

Patients

I have analysed 236 patients with a whiplash injury diagnosis. I examined them all as a legal expert during the last 10 years. In looking critically at the accident mechanism, 45 were not whiplash injuries, so that finally only 191 cases of pure whiplash mechanism were analysed. I have to stress a couple of facts particular to this patient group. I questioned and examined them all myself. All were seen many years after the accident and all were sent to me for an expert medical evaluation. At the time, I did not examine them considering the headache problem in particular. I was, however, interested in headaches in general. Therefore, not all the information we would like to have today, was gath-

ered. Nevertheless, the results of this large number of patients seen by the same expert and following a uniform scheme of questioning and examination might be of interest. I am, however, quite aware of the fact that the situation of that group of patients is a particular one. They all had had chronic health problems for years, they were seen for an expert medical evaluation and they were expecting compensation. This might have had an influence on the symptoms and the signs presented.

Results

The patients were not seen for a scientific study. Therefore, there was no control group. The patients were seen for medico-legal advice. The attention was not focused on their headache. I did consciously renounce to clarify the headache they presented following the IHS criteria, but simply tried to describe their characteristics. As a matter of fact also the IHS does not define the type of headache after whiplash and simply says "no typical characteristics known" (see table 4b).

Presenting the *findings in the 191 patients with a whiplash injury*, I will focus on the problem of headaches. To make it very clear, I am not con-

sidering neck pain, which was nearly always present, but I want to analyse headache pain as such. Table 5 gives an overall review of the different data in the 191 patients.

Of all the patients 104 were represented by a lawyer and 26 more were sent by a court. Of the 191 patients 63 were male, 128 female, so about 2 out of 3 were female. The average age of the men was 41.8 years (24–66) and of the women 37.5 (20–68).

All were victims of a road accident; 129 had suffered a rear-end collision, 33 a frontal collision and 27 another type of road accident with whiplash mechanism, but without head trauma.

The time elapsed since the accident was on average 4.23 years (1 to 26 years).

Before the accident, 28 persons had already suffered from more or less important headaches. As many as 119 claimed either to have never suffered from headaches at all or at least, to have never been seriously disturbed by a headache before. They never had to stop working to see a doctor because of a headache. In 44 there was no information available.

After the accident 16 patients out of the 191 did not get new headaches; 6 men and 10 women. Among these 16, 3 had had headaches before the accident, 6 did not and in 7 there was no information available. In one of the 191 it was not stated whether she had a new headache after the accident, and 174 of the 191 suffered a new headache after the accident. This means that 91% of the whiplash victims with long-standing health problems had a new type of headache after their accident.

Concerning the time frame, 124 of these 174 persons had their first headache immediately or not later than one day after the accident, 2 in the course of the first week, 9 in the course of one month following the accident and in 39 this information was not available.

Of the 174 patients who had a new headache after the accident, in 8 it had disappeared later, in 2 no information was available and in 164 persons the headaches persisted at the moment of the examination years after the accident.

The types of persistent headache after the whiplash injury in these 164 persons were as follows: in 108 patients the headache was bilateral or diffuse. Of these patients 74 described the pain as progressing from the neck forward to the vertex or more frequently to the forehead or "behind the eyes". In 29 it was simply diffuse bilateral, therefore not coming from the back. In 5 it could not be specified.

In 30 patients it was sometimes bilateral and sometimes unilateral, or bilateral with preponder-

Table 5 Headache in 191 patients with chronic whiplash syndrome. Summary of data.

subject	n	(%)
seen by request of a lawyer	130	(68)
seen by request of a court	26	(14)
♂ : ♀	63 : 128	
average age ♂	41.8 (24–66 y)	
average age ♀	37.5 (20–68 y)	
rear-end collision	129	(68)
frontal collision	33	(17)
other collisions	27	(14)
time since accident	4.23 (1–26 y)	
relevant headache before accident	28	(15)
new headache type	174	(91)
no (new) headache after accident	16	(8)
new headache within one day	124/174	(71)
new headache persisted after one or more years	164/174	(94)
persistent headache is diffuse	108/164	(65)
persistent diffuse headache from the back	74/108	(68)
persistent headache (sometimes) unilateral	30/174	(17)
of these coming from the back	30/30	(100)

ance on one side and always beginning in the back. In 15 it was always unilateral but not starting in the neck or the posterior part of the head. In 7 cases it could not be specified and in 4 patients after the whiplash trauma a typical migraine began and recurred more or less frequently. In the same patient more than one type of headache was rarely present.

The frequency of the persisting headache episodes varied widely. Of the 164 patients – years after the accident – the headaches were daily in 59, presented themselves more than once weekly in 55, once weekly in 17, between once and several times a month in 12, more rarely in 10 and in 11 no information was given.

In the 164 patients with continued persistent headache episodes the clinical signs in the cervical spine, essentially the mobility, were normal only in 57 at the moment of examination by the expert. Only 17 of the 164 patients did not have ongoing treatment during the past 6 months and in 11 cases this aspect was not specifically mentioned. All the others still had some ongoing treatment, mainly the intake of medication, but very often also physiotherapy, soft medicine and psychotherapy. Imaging had been done in all cases and no abnormal findings specifically due to the accident were ever seen.

Personal conclusions

From these findings I must draw the following personal conclusions:

- There is no doubt that an acceleration and/or deceleration injury in the cervical region is followed not only by neck pain but in many cases also by headaches. This was the case in 91% of my selected material.
- The headaches frequently have the following characteristics:
 - they most frequently start in the back of the head and are spreading towards the frontal region and “behind the eyes”;
 - they are more frequently bilateral, however, sometimes also unilateral;
 - they are mostly but not always also accompanied by symptoms and signs of a disturbance of the neck, either localised pain and/or intermittently reduced mobility of the head.
- In the chronic whiplash syndrome also the headaches tend to be long lasting.

However, I want explicitly to stress that the confirmation of frequent persistent headaches after whiplash injury to the neck does not automatically mean that these patients need constant physical or

other treatment, nor does it mean that they must be seriously handicapped or deserve compensation.

Discussion

I did not try to define the type of headache my patients experienced following the IHS classification 1988 or 2004 [8, 9]. This simply because it was a retrospective study and the information gathered about the type of headache was not detailed enough. Some reminded of a tension-type headache, but others were half-sided without having typical migraine traits. Only 4 corresponded to a classical migraine without aura. Others have claimed that 60% of their patients with *de novo* headache after whiplash had migraine without aura patterns [5]. We would agree if the unilateral-ity was considered to be the main criterion.

I do realise that in my personal series the headache frequency is very much higher [10, 11] or slightly higher [12–16] than the frequency other authors found. Headache after whiplash injury is considered by some authors as a short-lived affair [16]. This is also part of the definition of the 2004 IHS-criteria for acute headache. In Drottning et al. observations [11] the frequency was 8.2% of whiplash victims 6 weeks after the accident and dropped to 3.4% after one year. My patients were all cases with the chronic whiplash syndrome. They still had symptoms and among others also still had headaches. The difference in headache frequency is probably due to patient selection. I have seen patients mostly for medico-legal assessments many years later, i.e. patients who by definition have had long-standing symptoms and are seriously disabled.

The relationship between headache and neck mobility in my patients was not constant. Several patients with persistent headaches had a normal range of neck motion, which did not correspond to the experience of other authors, who had analysed their patients only during the first 6 months after the injury [17]. Farmers doing tractor work were interviewed by Sjaastad and Bakketeig: those amongst them having a headache mainly during the harvest always also had accompanying neck pain [18].

I did not try to quantify the intensity of the headache, because it was just part of a more complex pain syndrome and combined with other causes of disability. I did not apply a skin roll test [19] of another method of quantification [20].

The long duration of residual symptoms in my patients are not at all an exception. In Gothenburg

half of the patients with neck complaints following motor vehicle accidents still complained about symptoms, including headaches, 17 years after the accident [21].

While migraines are well-known after head trauma ("footballer's migraine"), it is not so generally accepted after whiplash injuries of the neck. I have observed a pure migraine in 4 of my patients. Others also have described migraine after neck trauma [22].

I have no information about the further development of the patients seen. However, they all had suffered their headaches for many years and had had all sorts of drug and physical treatments without success. Botulinum toxin, as has been proposed recently [23], has not been applied.

What might be the explanation for these headaches?

In contrast to the undoubted reality of the pain syndrome, the pathogenesis of these headaches seems less clear to me though. Of course, most people tend to blame the cervical spine and its joints and ligaments [7,21,24–28]. Many arguments could be brought forward in favour of this explanation. When the mechanism of whiplash was not known, Barré and Liéou in Strasbourg [1, 2] and Bärtschi-Rochaix in Berne [3] had already described headaches in patients with a known pathology of the cervical spine. Fredriksen et al. [29] had already published the result of surgery on the lower level of the cervical spine in 17 patients followed for 8.5 years. The patients all had in addition to other symptoms a headache. In 15 of the 17 cases the headache was improved, in 53% the result was even excellent or good. Diener (personal communication 2004) has recently looked for headaches in patients with a neurosurgical problem in the cervical spine. To his astonishment a large number of patients with a disc problem in the cervical spine had headaches that disappeared after successful neurosurgical treatment of their disc.

The problem does not seem that simple to me, however. In whiplash injury, not only the spine but other structures also suffer potentially. In cadavers exposed to a whiplash mechanism it was shown in histological sections that lesions were present in ligamentum flavum, anulus fibrosus, anterior longitudinal ligament and in the capsules of the zygoapophysial joints [30]. However, in whiplash injuries the muscles of the neck are also exposed to a brisk extension (lengthening), probably whilst being actively contracted, due to a reflex mechanism. This could have produced small tearings of

muscle fibres, small haemorrhages and scars. Sensory fibres of the neck tissue could have been torn by the same mechanism. Since we know that the sensory cells of the first two cervical segments are located in the caudal part of the trigeminal nucleus [31], this could explain why afferent stimuli from these fibres could be attributed to the cephalic trigeminal region and the pain therefore projected to the skull and other structures of the head [28, 32–35].

In the classification of the International Association for the Study of Pain (IASP) cervicogenic headache had already been included in the classification of chronic pain [35]. My personal material permits to conclude that headache exists after acceleration injury to the cervical region. It does not allow drawing more detailed conclusions concerning cervical headache in general. More research is needed to clarify the multiple causes of headaches after whiplash injury of the cervical region.

Treatment

In my personal cases there was scarcely any treatment which had not been tried on some of them. No one was efficient in the long run. More or less all of the patients ended up with the chronic intake of analgesic drugs. On the basis of the pathogenic hypotheses, manipulations do not seem indicated. Local application of heat or analgesic injection could make sense. However, there is no evidence-based successful treatment.

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