Dynamic Chiropractic

Making the Case against Late Whiplash

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It seems that 1999 was a banner year for the whiplash naysayers. In addition to the barriers such literature imposes for advances in automotive safety, it provides an ongoing source of grist for the ever-polarized medicolegal mill. Readers may recall my criticisms of the first Lithuanian paper of 1996 (reference 10), which appeared in DC that year. The authors revisited this problem of late whiplash more recently. Subsequently, a spate of particularly bad literature has appeared (chiefly from a Dr. Ferrari) that uses, as its chief foundation, these two fundamentally flawed misadventures of science. In this article, I'll explore the major problems with the recent (1999) Lithuanian paper and juxtapose them with the 1996 paper.

Clinicians treating victims of whiplash will find that the common defense strategies in arguing against the possibility of late whiplash will universally employ, among others, these two papers. Although they can be easily debunked, failing to do so will leave them as ostensibly very persuasive arguments against the likelihood of late whiplash. Translation: defense verdict pending.

The article is: Obelieniene D, Schrader H, Bovim G, Miseviciene I, Sand T. Pain after whiplash: a prospective controlled inception cohort study. *Journal of Neurology, Neurosurgery & Psychiatry.* 1999; 66:279-283.

The authors reported in their abstract:

> "Objectives-In Lithuania, there is little awareness of the notion that chronic symptoms may result from rear-end collisions via the so-called whiplash injury. After most such collisions, no contact with the health service is established. An opportunity therefore exists to study post-traumatic pain without the confounding factors present in Western societies.
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> Methods - In a prospective, controlled inception cohort study, 210 victims of a rear-end collision were consecutively identified from the daily records of the Kaunas traffic police. Neck pain and headache were evaluated by mailed questionnaires shortly after the accident, after two months, and after one year. As controls, 210 sex- and age-matched subjects were randomly taken from the population register of the same geographical area and evaluated for the same symptoms immediately after their identification and after one year.
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> Results - Initial pain was reported by 47% of accident victims: 10% had neck pain alone; 18% had neck pain together with headache; and 19% had headache alone. The median duration of the initial neck pain was three days and maximal duration 17 days. The median duration of headache was 4.5 hours and the maximum duration was 20 days. After one year, there were no significant differences between the accident victims and the control group concerning frequency and intensity of these symptoms.

> Conclusions - In a country where there is no preconceived notion of chronic pain arising from rear-end collisions, and thus no fear of long-term disability, and usually no involvement of the therapeutic community, insurance companies, or litigation, symptoms after an acute whiplash injury are self-limiting, brief, and do not seem to evolve to the so-called late-whiplash syndrome."

On first blush, it would appear that the authors of this latest study have conclusively demonstrated that the citizens of Lithuania are different in some important ways from Western European and North American persons. Based on the outcome of this inception cohort study of 210 rear-impact crash victims, it appears that the prevalence of chronic neck pain in Lithuania (6%) is much lower than in other parts of the world, where it has been reported to be much higher. In fact, some authors of the present study have previously reported a figure of 13.8%.[1]

In a more recent study of Canadian adults, the age-standardized lifetime prevalence of neck pain was reported to be 66.7%, and the point prevalence was 22.2%.[2] I won't belabor the issue, but some of the literature has this figure as high as 30% or more, depending on how one defines the term "chronic pain" and collects data.

Perhaps the citizens of a previously communist country are by nature a bit more stoic than those of Western nations. If that were true, it might call into question the usefulness or applicability of the authors' otherwise interesting findings. The balance of literature-flawed or otherwise-nevertheless finds that Western crash victims do suffer long-term pain to varying degrees.[3] This has been demonstrated to be independent of litigation in all studies holding litigation as an outcome variable.[4]

Translation: the authors' speculations regarding the legal system don't hold water.

The authors admitted that a number of confounding factors absent in Lithuania, but present in other studies - whose findings stand in stark contrast to the present study - make conclusions about the true differences between Western peoples and Lithuanians problematic. Nevertheless, the underlying theme promoted here is that in Lithuania, there is little or no awareness or experience of the notion of late whiplash - a theory that was not, it should be noted, directly tested in the present study, nor was any basis for it offered. Nevertheless, the authors assert that it is the mere expectation of chronicity, perhaps aided and abetted by physicians and lawyers, which result in higher rates of chronicity in Western countries. Do Americans and Europeans actually expect to have chronic neck pain from low-speed rear-impact collisions (LOSRIC)? I'm not aware that any such investigation has been conducted, but this is contrary to my clinical experience. Certainly not claims adjustors or accident reconstructionists!

Perhaps most surprising was the finding that none of the crash victims developed chronic pain as a result of their injuries and that the crash group almost universally fared better than the age- and gender-matched controls, with victims suffering less pain and enjoying better range of motion than those in the control group. This finding stands in stark contract to the 40 published outcome studies from the past 40 years. Chronicity in these studies has varied from a low of 12%, which stands out primarily as an outlier, to several over 80%, with a mean chronicity figure of about 55% for the rear-end variety.[5]

Translation: this is the first and only outcome study to find a 100% recovery rate - or anything even close to it. Moreover, those exposed to (or injured in) these crashes had less pain and better range of motion that controls. Now, if we could just get these guys to work on the problem of cold fusion.

Also called into question by the present study were notions regarding risk attributable to head position, gender differences, and the use of seat belts. These factors, however, have been identified by numerous other investigators (in many dozens of good studies) as significant outcome variables,[6] which makes an arguement for further comparative study. Moreover, no other studies have convincingly demonstrated that these factors are not important risk and outcome variables.

It is important to note that only 32% of the crashes in the present study would be considered LOSRIC by the more common definition (delta V 10 mph). In higher-speed crashes, the plastic behavior of the crushing vehicle mitigates some of the energy delivered to the occupants. In fact, it has been shown in a much larger study (n=15,000) that the risk of injury in lower-speed crashes is actually greater than in higher-speed crashes within the speed range that spans the transition from elastic to plastic collision damage (about 8-10 mph closing speed).[7] Yet the higher-speed (lower-risk) crash group in the present study is a likely inception cohort based on the authors' design, which relied on police records, since police are rarely involved in minor damage crashes in most countries, including Lithuania. This potential selection bias would likely reduce the number of chronic cases. The reported mean collision-closing speed in the present study was 40 km/h (25 mph), which the authors claimed was likely an exaggeration. Nevertheless, in the context of rear-impact crashes, spinal cord injuries and paralysis are not uncommon in this range,[8] and most production car seats fail completely under these loads.[9] It is quite unlikely that 210 people would evade more serious injury than trivial strains, and very odd indeed.

Another potential problem was that 43% of the vehicles had no head restraint. This is perhaps a reflection of the type of cars found in Lithuania. It is not consistent with cars of Western Europe or North America, yet it could also be a strong confounder. Ono and Kanno,[10] for example, found that neck stresses in volunteers subjected to rear-impact crash pulses were lower when no head restraint was present than when the restraint was in the low position -the most common position found in cars with adjustable restraints.[11] This high proportion of cars sans head restraints would also bias the cohort toward a more favorable outcome and subtracts from the study's external validity viewed from the context of European and North American injury rates and chronicity.

The authors assured readers that a "post hoc power analysis" was used to assess the potential for avoiding type II errors. To most this would seem particularly curious because power analyses are generally only done post hoc when someone other than the authors are determining a study's power or potential to show a statistically significant difference if one exists-it is not something one does with one's own study results! The utility of power analysis is during the study design phase. You make some assumptions about the differences you expect to get between the two groups and the number of persons you want to use, then you do the power analysis. This allows researchers to determine how many subjects they are likely to need in order to achieve statistically significant results.

However, here we find the most problematic aspect of their study. Using the current literature as a guide (conservatively, 15% to 30% of injured persons becomes chronic) and the alpha of 0.05 and beta of 0.20 chosen by the authors in their "post hoc" power calculation, we find that they would need at

least 376 persons in each cohort in order to detect a difference between cohorts as high as 33%. A difference of only 16% would have required 1,416 in each cohort. Thus there were not enough injured subjects to study differences between cohorts, much less the subset analysis of risk factors such as "position in car." Several subsets had less than 40 subjects in them. Translation: the study lacked sufficient power.

Also problematic in this study is that the enrollment criterion was not acute whiplash, but rather motor vehicle crash exposure. Thus the actual number of injured subjects in such a study is variable and dependent on the injury rate in these collisions. This same problem proved the fatal flaw in their previous study[12] and engendered the same criticism.[13]

In fact, since we criticized the study based on our post hoc power analysis back in 1996, I suspect this was what prompted their post hoc analysis of the data in the later study! For example, if the goal (as was stated in the title of the first paper) was to determine the natural history of whiplash in order to determine what proportion of whiplash victims develop late (chronic) whiplash, one would have to start with a cohort of persons with acute whiplash. Yet only a small fraction of the cohort was symptomatic for more than two weeks. Logically, from all we know about whiplash, we would not expect minor injuries lasting less than two weeks to present a risk for late whiplash. By way of analogy, we know that not all cigarette smokers will develop cancer of the lung. Suppose researchers wanted to study long-term cigarette smoking to determine what percentage of smokers developed lung cancer. It would be reasonable to start with a cohort composed entirely of smokers, since only smokers will develop lung cancer related to cigarette smoking. It would be silly to have a high proportion of non-smokers or those who smoke only occasionally in the cohort, unless of course one were looking for a dose response.

Even more curious is the fact that in the 1996 study, carried out in the same city and following the same design and enrollment criteria, the authors reported that only 15% of the exposed cohort sustained injury. In the present study, 47% were injured (28% with neck pain; 37% with headaches - a breakdown that is rather unusual in itself). The authors offer no explanation for this surprisingly broad disparity. However, this disparity alone offers compelling evidence that the authors missed something more important than the effect of expectation. By way of analogy, suppose researchers wanted to study, the risk of developing chronic neck pain among professional Australian soccer players, conducted an epidemiological study and reported that 15% of professional players had chronic neck pain after 10 years of playing ball. Then suppose they went back three years later, using the exact same methodology, and found the number to be 300% higher. Such a large disparity would not only require a compelling explanation, it would strongly suggest some type of serious error in data collection or analysis - or perhaps both.

Based on the balance of literature, which the authors paid little attention to, and the findings of these two Lithuanian studies, it seems likely that serious systematic or random errors have been introduced, rendering the results of these studies meaningless in terms of comparisons to Westernized nations. Serious design flaws and power limitations further compromise attempts to derive any useful meaning from them. However, the authors have raised an interesting question with their premise, unproven as it seems to remain, and Dr. Michael Freeman and I, along with other colleagues, are currently working on other international studies of this kind in Japan, China, and Great Britain. Is there a difference? We'll find the answer to that question one day. For now, there is no good evidence to believe there is.

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