

Chronic Whiplash: is it really a medical mystery?

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We read with great interest *The Atlantic* article, “Chronic Whiplash is a Medical Mystery”. The author, Julie Beck, raises the classic questions associated with work-related and personal injuries, such as: **“Why do some people fail to fully recover after being jostled in a car accident that should only cause a few weeks of pain?”** Inevitably this leads to skeptical questions such as: **“Are these folks faking it for insurance money or a nice settlement?”** or **“Isn’t the resulting chronic pain really just all in their heads?”** Ms. Beck provides an historical perspective in relating the acknowledged symptoms of modern day whiplash to what Dr. John Eric Erichsen first coined “railway spine”...a 19th century diagnosis for the **peculiar constellation of symptoms** reported by passengers involved in railroad accidents.¹

Beck cites Dr. Erichsen’s explanation for “railway spine” as a “jarring back and forth of the spine”, and then provides dismissal of this early description as lacking any specific explanation of exactly what might be happening to the spinal column. New evidence however is suggesting that Dr. Erichsen may not have been off the mark with his “jarring back and forth of the spine” explanation. Indeed, he may have been 180 years ahead of his time but lacking the tools of modern medicine to investigate and demonstrate his “railway spine” theory.

Are modern patients with whiplash associated disorders (WAD) manifestations of a so-called “whiplash culture” as suggested in Beck’s article? If so, then what is the explanation for the “railway spine” cases a century and a half ago—cases that preceded the modern whiplash culture, and also came decades before the ubiquity of modern auto insurance policies? Ms. Beck describes whiplash culture as the predisposition that **“if you’ve been involved in a motor vehicle collision, you’ll probably have some significant problem as a result”**.

Isn’t the whiplash culture thesis really just another way of saying that chronic pain is a condition unique to the greedy and weak-willed? Interestingly there is little evidence to support these claims. Ng and colleagues conducted a survey of over 800 laypersons in Australia and Singapore to collect their beliefs about whiplash, and an overwhelming majority of those not previously injured endorsed generally positive expectations regarding quick and early recovery.² While survey research is difficult to interpret, results such as these do not appear to support the existence of a whiplash culture in those regions. As to those early train travelers 180 years ago who were involved in railroad collisions, were they also “whingers” in a weak culture seeking

someone or something else to blame for their pain? On the contrary, weren't these actually hardy souls, living in the cold dampness of chronically under-heated British homes at that time, breathing the toxic fumes of London coal-smoke-infused fog, hacking their way through their short lives burdened daily by a plethora of very real physical miseries? Were their railway spine complaints a result of weak will? Can it really be that the strikingly similar chronic symptoms from 19th century railroad collisions and 21st century motor vehicle collisions have no physical basis?

The latest evidence is pointing to new and testable hypotheses that "railway spine" and whiplash injuries may both be manifestations of real, but not yet widely recognized or acknowledged, physical injury to the "soft-tissues" of the head and neck compounded by a torrent of personal and societal stressors that render whiplash very different from many other personal injuries. There are in fact clear clinical signs and symptoms from the biopsychosocial domains to explain why some, but not others, have persistent problems.

It is very important however to properly define the terms of the argument here. The so-called "mystery" of whiplash is not about all or even a majority of victims of whiplash who report chronic pain. Scientific evidence dating back nearly 20 years shows marked consistency across a number of cultures: The vast majority of patients should and do in fact recover spontaneously in the 6- to 12-week time frame shown by Ferrari and others. However, an estimated 20 to 25%³ of whiplash events result in chronic pain-related disability.

The real mystery of the whiplash story is not the lack of explanation for the chronic complaints that persist in this unfortunate group. The real mystery is the stubborn persistence of outdated notions of malingering, faking, symptom magnification and psychosomatic illness, that continue to fly in the face of rapidly accumulating evidence pointing to identifiable physiological processes following whiplash events.

While there is doubtless an occasional rogue who feigns a whiplash associated disorder for personal gain, the expanding international base of empirical research tends to suggest that such behavior (where it can be identified) is rare and difficult for the "pretender" to maintain. The balance of current research does

demonstrate some association between litigation and the amount of pain these people say they experience; but there is no evidence to suggest that one causes the other, or that most people suddenly recover once their case is settled.^{4,5} Clearly, labeling chronic whiplash a “mystery” is an easy sell to a general populace that has never been so injured, and is a convenient canard appealing to those fed up with high insurance rates.

In considering the rapid progression of knowledge around the physiological and psychological effects of whiplash, we are reminded of another mysterious case of misidentified causation of a chronic ailment: gastric and duodenal ulcers, commonly known as stomach ulcers. For decades it was accepted as medical dogma that stomach ulcers resulted from excess production of gastric acids associated with a physiological response to heightened stress and overstimulation of the sympathetic nervous system. These patients were instructed to alter their diet and reduce their stress. That was the conventional wisdom until 1982 when two Australian physicians put their professional reputations on the line in challenging contemporary medical orthodoxy. Despite being consistently ridiculed, their reputations were finally redeemed when they received the 2005 Nobel Prize, 23 years after they initially proposed the hypothesis. The Nobel Committee’s press release explained the overturning of the gastric acid theory of ulcers in this way:

This year's Nobel Prize in Physiology or Medicine goes to Barry Marshall and Robin Warren, who with tenacity and a prepared mind challenged prevailing dogmas. By using technologies generally available (fibre endoscopy, silver staining of histological sections and culture techniques for microaerophilic bacteria), they made an irrefutable case that the bacterium Helicobacter pylori is causing disease. By culturing the bacteria they made them amenable to scientific study.

In 1982, when this bacterium was discovered by Marshall and Warren, stress and lifestyle were considered the major causes of peptic ulcer disease. It is now firmly established that Helicobacter pylori causes more than 90% of duodenal ulcers and up to 80% of gastric ulcers. The link between Helicobacter pylori infection and subsequent gastritis and peptic ulcer disease has been established through studies of human volunteers, antibiotic treatment studies and epidemiological studies.

As it turned out stress was not the primary cause of these sometimes-fatal ulcers, but likely a contributory factor. Somewhat paradoxically, it may be argued that medicine’s preoccupation with forcing patients to reduce stress and improve diet instead had the unintentional side-effect of making patients feel more stressed over their inability to control their stress! When in doubt and when lacking a sound scientific explanation, isn’t it ironic that the patient is usually the one who receives the blame.

So, what does modern research have to say about whiplash? There are multiple well-known mechanistic models for whiplash and whiplash recovery that Ms. Beck failed to recognize in her article. These include, but are not limited to 1) injury involving the peripheral and central nervous systems,⁶⁻¹⁴ 2) genetic vulnerability,^{15,16} 3) stress system dysregulation,¹⁷⁻¹⁹ and 4) maladaptive beliefs and cognitions that still have physiologic bases.²⁰ The evidence for actual and measurable physiological changes in response to a traumatic event such as a motor vehicle collision (MVC) is growing every day.²¹⁻²⁶

As for one example, work from our own lab at Northwestern University in Chicago,⁸ and from our previous work at the University of Queensland in Brisbane, Australia,⁷ has consistently demonstrated profound changes to the neck muscles that appear to be unique to that group of roughly 25% of individuals with poor functional recovery from whiplash. We have now tested over 250 individuals during the weeks and months after a whiplash, using advanced but widely available magnetic resonance imaging (MRI) sequences to quantify such muscle changes. The use of rapid acquisition 3D fat/water imaging, a relatively uncommon application of musculoskeletal MRI following whiplash injury, allows us to precisely measure changes in size and shape of muscles in the neck (multifidus, semispinalis cervicis, semispinalis capitis, splenius capitis, longus colli, longus capitus, and sternocleidomastoid). This represents a completely different radiological analysis of post-whiplash necks, compared to what is typically performed in emergency rooms or at the request of medical physicians treating these patients. The typical cervical spine x-ray or MRI is analyzed using methods that focus on and try to rule out injuries such as spinal fractures, spinal instability, bleeding, herniated discs, or observable physical ruptures of muscles, tendons, or ligaments. This traditional approach is indeed necessary to rule out potentially major structural damage, and we advocate that the traditional MRI interpretations, supported by well-known guidelines, need to be continued. However our techniques permit a detailed analysis of more understated physiological changes in the muscle tissues that occurred not as a sudden physical event, but what appears to be a gradual change of the bulk and composition of muscle tissue over a period of weeks to months. Such changes cannot be seen using traditional MRI techniques. The physiological changes in muscle we are discovering cannot therefore be typically seen because physician diagnosticians are neither looking for them nor using the techniques that would enable them to observe and measure these changes.

Readers should be aware that while the current mechanistic models and measures detailed above represent new and exciting starting points, they are not to be considered definitive end points. As researchers we recognize and fully anticipate that with time and new research findings some of the above models and measures will be modified, combined, expanded, or refined. However, ignoring the availability of this growing body of evidence from a number of investigators around the world does nothing but preserve a sense of clinical hopelessness when clinicians ***continue to make educated guesses*** regarding the origins of persistent symptoms following a car crash (e.g. whiplash). It remains true that in the vast majority of whiplash cases, structural damage on conventional imaging is not visible²⁷ and this likely contributes to the rhetorical question posed by Malleson (and likely believed by many): ***Why should neck and back sprains fail to recover when sprains in other parts of the body usually heal without trouble? There is nothing special about neck ligaments and muscles that can account for their failure to do so.***²⁸ Malleson's question makes sense. Interestingly however, this question appears to be accepted as an explanation for the phenomenon of chronic whiplash rather than what it really is: an admission of a failure to explain. Conversely, we as researchers ask the same question *but we then seek to answer it*. The whiplash question should be of particular interest to patients, clinicians, payers and policy-makers at all levels. Labeling chronic whiplash syndrome as a mystery attributable to a "whiplash culture" only stifles research that may lead us in productive new directions. Where would we be if scientists had ceded to the "mystery" of cancer and simply decided to stop exploring the condition? How long did patients with gastric ulcers have to suffer and blame themselves for their inability to control their stress, when the real problem was that physicians and scientists were asking the wrong questions and looking in the wrong places for the answers? Like these other conditions, chronic pain following some whiplash injuries is indeed somewhat mysterious, but we believe it is a penetrable mystery if only we ask the right questions and look beyond the typical approaches that merely reinforce the mystery.

Julie Beck's article in The Atlantic unfortunately is based on assumptions by the public, by policymakers and by medical professionals that individuals with persistent symptoms are malingering, exaggerating, or psychosomatic. If our hypothesis is correct that the 25% of chronic cases are not malingerers or insurance-

cheats, it follows that these individuals with legitimate post-traumatic neck or related pain disorders find themselves in the unenviable and highly problematic position—a catch-22 if there ever was one—of having to prove against a plethora of doubting Thomases that their condition is real. They are thus labeled guilty until proven innocent of claiming an injury others believe does not exist, forcing these people to try ever harder to prove the reality of their pain and dysfunction. The harder they try, the more stressed and deranged they appear to others. Indeed, for this reason, chronic pain is somewhat unique in the medical arena, in that it is one of very few conditions in which sufferers *hope* for a positive finding on diagnostic imaging (to prove that their pain is “real”), and are disappointed by a negative one.²⁹ When the results come back as “normal” because no structural damage is found, the unfortunate person must now suffer the daily scrutiny and suspicion of their physicians, friends, families, lawyers, insurers, employers and the broader society. We are reminded of Nortin Hadler’s aptly titled 1996 article³⁰ in the scientific journal *Spine*: **“If you have to prove you are ill, you can’t get well”**. He adds, ***‘There may be much agonizing, but in the absence of impairment, society is not prepared to believe them. Rather, society is willing to go to great lengths and great expense to challenge their perception.’***

Sadly, the one-sided nature of The Atlantic’s ‘mystery’ article on whiplash presented an out of date view of whiplash that only exacerbates the predicament of post-collision patients who do have real physiological evidence supporting their chronicity, but who tend to be labeled with scarlet designations such as “structurally normal with psychological overlay”. The plethora of interdisciplinary work currently accumulating and easily accessible in this field of chronic post-collision pain is gradually unlocking this so-called “mystery” and will continue to do so if we follow the advice of the greatest scientist of the 20th century:

“We can’t solve problems by using the same kind of thinking we used when we created them.”

—*Albert Einstein*

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