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Spinal injuries following motor-vehicle accidents

A REVIEW, FROM A MEDICAL PERSPECTIVE, OF LITERATURE FOCUSING ON SPINAL INJURIES FOLLOWING VEHICULAR ACCIDENTS

It is well known that trauma, whether from a motor-vehicle accident, a slip and fall incident, a sports injury or a work injury, can cause onset of neck and back pain requiring treatment. The severity of the injury and the need for subsequent treatment varies greatly with individuals.

An extreme example is demonstrated in an article in the *Spine* journal in November of 2009 (González-Bonet and Mollá-Torró, 2009). A 31-year-old woman did have a history of prior disc problem at L5-S1 requiring treatment. However, shortly after a motor-vehicle accident, she presented to the emergency room with loss of bowel and bladder control requiring emergency surgery. MRI following the vehicular accident demonstrated that the disc herniation had extruded with significant compression of the neural elements, leading to acute loss of bowel and bladder function.

In this scenario, where there is a preexisting MRI, there is little to dispute regarding the causation of the massive disc herniation following the vehicular accident requiring surgery. However, it is well known that individuals will have disc herniations and may be asymptomatic. This is frequently used as an argument to avoid paying for treatment of someone who is injured and suffered a disc herniation or other spinal injuries from a vehicular accident.

In the adult population that does not have disabling lower back pain, the incidence of disc herniation and disc degeneration is between 28 percent and 85 percent (Beattie, 1996). The percentage of abnormality increases with age. This will sometimes falsely lead individuals to argue that the disc herniation is not the source of pain as it may have been preexisting. Scientific studies dispute this finding.

A study by Paajanan showed that in 20-year-old military recruits, there were 57 percent incidence of MRI abnormalities in those with back pain and 35 percent incidence in those without (Paajanan et al., 1989). In another study, only 15 percent of asymptomatic individuals had disc herniations compared to a similar group of symptomatic individuals where they had 42 percent abnormality (Parkkola et al., 1993).

In a surgical group, neural compromise was present in only four percent of asymptomatic subjects compared to 54 percent of symptomatic subjects (Boos et al., 1995). Therefore, one can conclude that although an MRI may be abnormal in asymptomatic individuals, it is much more likely to be highly abnormal in individuals having symptoms. Neural compromise is much more commonly seen in individuals requiring interventional treatment such as epidural injections or surgery.

It was "preexisting degeneration"

It is also sometimes argued by so-called "experts" that disc herniations must have preexisting disc degeneration. However, the article in *The Bone & Joint Journal* of August 2013 disputes this finding, indicating that there is no scientific validity to the argument that the disc must have been degenerated before it could herniate. Therefore, a previously normal disc can herniate and may not necessarily have preexisting disc degeneration (Lama et al., 2013).

It is well known that discs fail and herniate with axial compression or compression and torsion. This is the same mechanism that occurs in spinal fractures following motor-vehicle accidents. The publication in May of 2013 in *Accident Analysis and Prevention*, in fact, indicates that with increased use of seatbelts and new airbag technologies, there has been a decrease in severe spinal fractures, but an actual overall increase in the total numbers of spinal fractures (Kaufman et al., 2013). Data shows that an axial load is transmitted from the pelvis into the seat pans of the front crashes causing these types of burst fractures and compression fractures. Forces great enough

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to cause spinal fractures can similarly lead to disc herniations or disc injuries with onset of pain and subsequent disability.

Low-impact accidents

Scientific data shows that the impact does not have to be significant to cause a spinal injury. The article on whiplash injury published in *The Journal of Bone & Joint Surgery* on June 30, 2009, states that "it has been recognised that the disability from whiplash is associated less with tyre [tire] skid marks or the degree of vehicle damage than the effect of differential velocity on the head and upper torso" (Bannister et al., 2009, p. 845). In fact, it points out that 90 percent of whiplash injuries occur with speeds less than 14 mph. Furthermore, it points to the fact that summary of literature on crash tests on human subjects concluded that a velocity of 2.5 mph was sufficient to cause symptoms. A speed of 8.7 mph was required to cause actual damage to the vehicle. They point to not only symptoms of neck pain and stiffness, but also secondary effects including forgetfulness, post-trauma disorder, and driving anxiety. Depressive symptoms can occur after six weeks.

They also point to the argument proposed by defense advocates that the claimant's symptoms will disappear once litigation has resolved. However, they point to multiple studies in the literature that showed evidence to the contrary indicating ongoing symptoms well after the case is settled. Using multiple references, they note that just under 50 percent of all patients made a full recovery and that 4.5 percent were permanently disabled.

The same informative article notes that between five percent and nine percent of patients develop subacromial impingement syndrome. Of those with persistent pain who undergo a subacromial decompression after a whiplash injury, 50 percent described benefit (Chauhan et al., 2003). This is consistent with the author's experience that about 10 percent of patients with a whiplash type injury develop signs and symptoms of shoulder tendinitis and impingement even when they have not had direct shoulder trauma.

An article in *Archives of Physical Medicine Rehabilitation* from March of 2014 points to a study in Canada showing symptoms of individuals following a motor accident suffering from symptoms of a mild traumatic brain injury, including sleep disruption, tiredness, dizziness, forgetfulness, vision problems, hearing problems, headaches, neck pain, and mid back pain in 1716 adults. Seventy-five percent were experiencing this after three months (Cassidy et al., 2014). Although the incidence decreased over the course of the year, many continued to be symptomatic and were seeking continuation of treatment. They were going to multiple providers to treat their symptoms.

Another study points to the prevalence of worsening symptoms in older individuals being involved in motor vehicle accidents. In these older individuals, many times studies revealed disc degeneration and disc herniations, which are sometimes attributed to aging. However, it is forgotten that these individuals are much more prone to injury and have lingering pain. In one study of 161 participants, 72 percent had moderate to severe pain initially in the emergency room and 26 percent reported moderate to severe pain six months after the motor vehicle accident (Platts-Mills et al., 2016). They demonstrated that a large number had continued loss of function and disability well after the accident.

Different people, different pain

In addition, it is noted that not all individuals react the same way following a disc injury. Why does an individual with a two to three mm disc herniation complain of severe back and radicular pain and yet someone with a six mm disc herniation does not have significant pain? We are now gaining greater understanding of biological issues that contribute to back pain.

A study by Kang et al. published in the *Spine* journal reflects that individuals who had symptomatic disc herniations had increased levels of nitric oxide, prostaglandin E2, and interleukin-6 (Kang et al., 1996). Therefore, it is being increasingly understood that there are chemical mediators of pain, which are not really measured on MRI scans or other studies. The textbook on interventional spine points to the following: "Mechanically compressive disc protrusions are not the only causes of radicular pain. For this reason, chemical markers from the disc have been implicated in the inflammatory response" (Slipman et al., 2008, p. 820). They point to higher concentrations of prostaglandin E2 being found in individuals with positive straight leg raising tests. They also point to the fact that matrix metalloproteinases, nitric oxide, IL-6, and prostaglandin E2 have been implicated in intervertebral disc protrusions. This chemical reaction, which irritates nerves and causes pain, is released post accident. The chemical reaction may be a good explanation as to why epidural injections, which reduce an inflammatory response, are highly successful. As we point out to patients, epidurals do not reduce the size of disc herniation, but, frequently, an individual may have complete resolution of his or her symptoms following the procedure.

In summary, the severity of pain and disability following vehicular accidents is frequently discounted by interested individuals using explanations by biomechanical engineers and recruited "expert" physicians. However, the scientific literature points otherwise. These so-called "experts" frequently point to the fact that many individuals who are pain-free also have disc herniation. However, as I have pointed out, clearly, there is a much higher level of MRI abnormality in symptomatic individuals than non-symptomatic individuals. We know that vehicular accidents can cause severe injuries, including fractures, dislocations, and paralysis.

Vehicles and people bruise differently

However, it is also known that even impacts at much lower speeds can cause onset of neck and lower back pain. This has been established even in volunteer test individuals. As I have discussed, studies demonstrate that the extent of vehicular damage does not always explain the

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severity of neck and back pain. I then question the need to bring in biomechanical experts and accident reconstruction experts when scientific medical data clearly establishes that one can have a spine injury without any actual vehicular damage. It is also established that the extent of subsequent disability is not really related to the skid marks or speed. Clearly, if one can injure their neck at a speed below where damage can occur to the vehicle, then all the money spent on these experts appears to be unnecessary.

As I always point out, these biomechanical experts are mathematical geniuses, but they work, as we have seen on Mercedes Benz commercials, with dummies. My patients are real-life human beings and not dummies. They are subject to different injuries. The biomechanical experts do not really have an understanding of the medical basis for injury. Multiple studies also point to the fact that individuals have ongoing chronic pain and disability more commonly seen in older individuals and this disability persists well after their case is settled.

We are also now gaining further insight into the biological basis of spinal pain and know that a disc, when injured, can cause release of irritating chemicals from the disc, which cause pain and disability. These chemicals are not noted on MRI scans or physical examinations performed by independent medical examiners. Levels of these chemicals have been noted to be elevated in individuals having pain and radiculopathy. However, the understanding of the chemical mediators of pain has caused us to develop new technologies, advancing from epidural steroid injections to platelet rich plasma injections and stem cell therapy. There is emerging hope to treat the pain and disability of these individuals suffering consequences of vehicular accidents and other types of spinal injuries.

Chiropractic care often a first step

The first step in recovery from spinal injuries sustained from vehicular accidents involves rehabilitation of the injuries by initiating chiropractic care and/or physical therapy. In a large randomized study conducted in Minneapolis, Minnesota (272 participants), comparison was made between spinal manipulative therapy (chiropractic), a home exercise program provided by an exercise therapist, and medication management by a licensed physician (prescribing nonsteroidal anti-inflammatory drugs, muscle relaxants, and narcotic medications) for management of acute and subacute neck pain (Leininger et al., 2014). The study showed significantly greater reduction in pain and greater global satisfaction in the spinal manipulative group (chiropractic) than the groups with exercise program or medication alone. Please note that the chiropractic group was not receiving medication yet reported overall best pain improvement scores.

Chiropractic and physical therapy

Another comprehensive study summarizes results in eight clinical trials of whiplash sufferers in the acute and chronic phases receiving manipulative therapy (chiropractic) and physical therapy (Vernon and Humphreys, 2007). The groups receiving manipulative therapy and physical therapy uniformly demonstrated statistically significant reduction in pain, improved function, and more rapid return to work than the groups receiving a soft collar and medical advice.

"Six therapy sessions and a bottle of Motrin"

Two trial studies published by Fernández-de-Las-Peñas et al. concluded that there was greater pain reduction and more rapid recovery when manipulative therapy was combined with physical therapy modalities than when physical therapy was administered alone (Fernández-de-Las-Peñas et al., 2004). Furthermore, there was a reduction in pain scores by almost 50 percent when therapy was continued from beyond four to eight weeks of treatment. However, there was still substantial residual pain at eight weeks, implicating additional treatment beyond eight weeks would be ideal to reach maximum medical improvement. This data strongly contradicts opinions voiced by some IME's that six sessions of therapy and a bottle of Motrin is all that is necessary for the treatment of whiplash disorders. Although these arguments are pleasing for their payers, they were clearly not scientifically based.

Patients who do not progress and recover after receiving manipulative therapy and/or physical therapy and have exhausted pain management options, such as epidurals and facet blocks, usually begin to consider surgical options to alleviate pain and suffering from their spinal injuries. Newer surgical options, which are far more minimally invasive and allow outpatient surgical management including endoscopic discectomy, cervical disc replacement surgery, and interspinous process stabilization devices, allow more rapid recovery and restoration of pre-injury function, giving patients greater hope and satisfaction.

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