Whiplash: a review of a commonly misunderstood injury

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Jason C. Eck, Scott D. Hodges, S. Craig Humphreys
This review article has 64 references.

FROM ABSTRACT

Whiplash injury is a relatively common occurrence, but its mechanism and optimal treatment remain poorly understood.

It is estimated that the incidence of whiplash injury is approximately 4 per 1,000 persons.

The most common radiographic findings include either preexisting degenerative changes or a slight flattening of the normal lordotic curvature of the cervical spine.

Computed tomography and magnetic resonance imaging are generally reserved for cases of neurologic deficit, suspected disc or spinal cord damage, fracture, or ligamentous damage.

Biomechanics studies have determined that after rear impact C6 is rotated back into extension before movement of the upper cervical vertebrae. Thus, the lower cervical vertebrae were in extension while the upper vertebrae were in a position of relative flexion, producing an S shape in the cervical spine. **["S"]** It is believed that this abnormal motion pattern might play a role in the development of whiplash injuries.

Historically, a soft cervical collar has been used early after the injury in an attempt to restrict cervical range of motion and limit the chances of further injury. More recent studies report rest and restriction of motion to be detrimental and to slow the healing process. **[IMPORTANT]**

THESE AUTHORS ALSO NOTE:

The term was first used by Prior to H. E. Crowe using the term "whiplash" in 1928 to describe the effects of sudden acceleration-deceleration forces on the neck and upper trunk, the injury was referred to as "railway spine" to describe common injuries of persons involved in train accidents.

Whiplash injuries are common and can have significant long-term consequences.

"Between 4% and 42% of patients with accident-related neck injuries report symptoms several years later."

The New England Journal Of Medicine study on whiplash by chiropractor David Cassidy et al [J.D. Cassidy, L.J. Carroll, P. Cote et al., Effect of eliminating compensation for pain and suffering on the outcome of insurance claims for whiplash injury. N Engl J Med 342 (2000), pp. 1179-1186], showed that in Saskatchewan, Canada, that elimination of compensation for pain and suffering resulted in a decreased incidence and improved prognosis of whiplash injury. The incidence of claims decreased by 46% among men and 15% among women. However, this study by Cassidy was criticized because of the multiple limitations of the study, including the existence of confounding factors and questionable exclusion criteria.

This review article provides a summary of reports that have investigated the organic nature of whiplash injury with emphasis on the biomechanical basis of whiplash injuries.

WHIPLASH SYMPTOMS

Patients with whiplash injuries often have symptoms that are out of proportion to objective findings.

"It is generally not possible to identify the injury in the acute phase even when expensive imaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI) are utilized."

"It is possible that the elderly and others with degenerative changes may be predisposed to whiplash injuries because they have less strength and stability in the spine to withstand the forces of an impact."

MECHANISM OF WHIPLASH INJURY

Historically, it was believed that the rear impact collision caused the head and neck to be forced into a hyperextended position, inducing strong compressive and translational forces on the joints and soft tissue structures.

More recently, it has been determined, that after rear impact, C6 was rotated back into extension prior to movement of the upper cervical vertebras, which in turn caused C5 to extend.

"Thus, the lower cervical vertebras were in extension while the upper vertebras were in a position of relative flexion, producing an "S" shape in the cervical spine."

"This pattern of movement differs from normal physiologic motion, in which motion of the neck occurs from the top downward."

The facet capsule is probably injured, especially if the head is rotated at the time of impact.

Research results support previous claims "that as many as 57% of persons with chronic symptoms for more than 2 years reported having their heads rotated at the time of impact." **[WOW]**

Research has shown that the sternocleidomastoid lengthened while the paraspinous contracted after the impact, predisposing the person to contraction-induced muscle injury.

"Cervical motion after rear impact is initiated at the lower cervical spine in an abnormal S-shaped movement pattern."

Automobile safety devices, including seat belts and head restraints, may be detrimental in some whiplash cases.

As an example, restraining the torso to the seat with a belt prevents it from being able to dampen the applied forces. This results in a greater percentage of the force being transmitted directly to the unstabilized head and neck.

Head restraints are often kept low, allowing the head to extend over the top of the head restraint causing greater injury.

Also, the S-shaped curve of the cervical spine, which causes the initial injury to the structures of the neck, has occurred before the neck is hyperextended.

"Because the head restraint is not able to prevent this S-shaped curve, it may not be effective in preventing whiplash injuries."

TREATMENT OPTIONS FOR WHIPLASH INJURY

"A soft cervical collar has generally been used early after the injury in an attempt to restrict cervical range of motion and limit the chances of further injury, but recent studies report that rest and motion restriction are detrimental and slow the healing process."

The authors list 5 research articles to support the concept of early controlled motion to treat whiplash injuries: **[GATE THEORY CONCEPT]**

(1) G.E. Borchegrevink, A. Kaasa, D. McDonagh et al., Acute treatment of whiplash neck sprain injuries. Spine 23 (1998), pp. 25-31.
(2) L.A. McKinney, J.O. Dornan and M. Ryan, The role of physiotherapy in the management of acute neck sprains following road-traffic accidents. Arch Emerg Med 6 (1989), pp. 27-33.
(3) K. Mealy, H. Brennan and G.C. Fenelon, Early mobilization of acute whiplash injuries. BMJ 292 (1986), pp. 656-657.
(4) M. Rosenfeld, R. Gunnarsson and P. Borenstein, Early intervention in whiplash-associated disorders. A comparison of two treatment protocols. Spine 25 (2000), pp. 1782-1787.
(5) L.A. McKinney, Early mobilization and outcome in acute sprains of the neck. BMJ 299 (1989), pp. 1006-1008.

These studies on the value of early motion "treatment protocols have been shown to have both short-term benefits and sustained benefits 2 years after the injury." **[GATE THEORY CONCEPT]**

"It has been suggested that the chronic pain resulting from excessive rest and restriction of cervical motion after injury might be due to muscle atrophy and resultant loss of regional blood flow."

A 1998 study in SPINE indicates that the use of high doses of steroids given within 8 hours of injury resulted in significantly fewer disabling symptoms, fewer total sick days, and a better sick-leave profile. However, many patients involved in minor motor vehicle accidents do not have pain until hours or even days later, so they would not be seeking medical treatment within the 8 hour window of this study.

Another more-invasive treatment option for chronic whiplash pain includes cervical radiofrequency neurotomy, which denatures the nerves involved with the chronic [facet] pain of whiplash. Studies show that 71% of patients had long-term complete relief of their pain for about 14 months.

Even though a large portion of whiplash patients would recover within 6 months without any treatment, treatment in the acute phase "may speed the recovery process and limit the amount of pain experienced during recovery."

"All decisions on treatment options should be made on an individual basis based on a patient's specific complaints and the physical findings."

"Recent studies have shown that the optimal treatment should begin soon after injury to maintain muscle strength and range of motion."

FROM DAN MURPHY:
I believe that the most important aspects of this article are:

(1) Whiplash produces an S-shape in the cervical spine.

(2) Whiplash injuries can have significant long-term consequences.

(3) 4% to 42% of patients with accident-related neck injuries report symptoms several years later.

(4) It is generally not possible to identify the injury in the acute phase even when expensive imaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI) are utilized.

(5) During whiplash, the facet capsule is probably injured, especially if the head is rotated at the time of impact.

(6) As many as 57% of persons with chronic symptoms for more than 2 years reported having their heads rotated at the time of impact.

(7) "It is possible that the elderly and others with degenerative changes may be predisposed to whiplash injuries because they have less strength and stability in the spine to withstand the forces of an impact."

(8) Automobile safety devices, including seat belts and head restraints, may be detrimental in some whiplash cases.

(9) Treatment with rest and restriction of motion are detrimental and slow the healing process.

(10) Early controlled motion to treat whiplash injuries improves both acute and late phase clinical status.

(11) Motion treatment in the acute phase "may speed the recovery process and limit the amount of pain experienced during recovery."

(12) Cervical radiofrequency neurotomy does not work on all patients. [71% of those with facet pain], and does not effect a permanent cure [relief for about 14 months].