A Closer Look at Whiplash  
By Linda Cain, RN, CLNC

On October 14, 2008, Max, a 54 year old male, was the restrained driver of a Jeep Cherokee who had slowed down to nearly a stop due to construction. He never saw the 18 wheeler coming up behind him without stopping. He rode on 2 wheels for 2-3 car lengths. The impact caused his seat to totally break off at the hinges and he ended up lying in the back seat area. He immediately noticed neck pain, burning in his feet and legs, low back pain, left arm/shoulder pain, slurred speech and arm tingling/numbness down to his fingers. 24 hours later his symptoms had escalated to include headache, memory loss, and speech problems. His left arm was so weak he had to carry it with his right one.

This is a true scenario of a case I assisted an attorney with. It was a year after the accident and I reviewed the medical records then conducted an interview with Max and his wife. What I heard was heartbreaking. Prior to the accident he was the picture of health, had no physical limitations and did not even take any medications. A year after the accident he was suffering from weakness so severe he had to support his head and neck when riding in a car due to overstretched ligaments in his neck. In addition, he had severe pain and neuropathies, hypothyroidism, gait problems requiring a walker, dizziness, was unable to drive, extreme sensitivity to light and noise, and personality changes. He also had spinal surgery which resulted in a post-op infection. He was having syncopal spells if he bent over due to vertebrobasilar insufficiency resulting from osteophytes formation of C2-C3. I could keep going on. Although not all his injuries were attributed to acceleration/deceleration syndrome or whiplash, a vast majority of them were. A “simple” whiplash can cause catastrophic injuries, sometimes even permanently.

What is Whiplash

Whiplash is the most common injury after a motor vehicle accident. Whiplash occurs when there is rapid acceleration – deceleration causing the head to move suddenly or whip in one direction and then recoil in the other direction, resulting in injury to the cervical spine and surrounding structures. This “whipping” motion of the head strains the muscles and ligaments of the neck beyond their normal range of motion. Because whiplash is a non-medical term, it may be referred to as hyperextension/hyperflexion or acceleration/deceleration injury instead.

Studies show that significant injury can occur at low speeds and the larger the striking vehicle, the stronger the force and resulting injuries. With accidents involving 18 wheelers this greater force due to their height and weight is astronomical in comparison to a car or pick-up. Whiplash is characterized by a collection of symptoms that occur following damage to the neck, also know as whiplash associated disorders.

Symptoms of Whiplash

Typically whiplash injuries heal within 3 months but 15-20 % suffer long-term damage. If it hasn’t healed within 6 months it is considered chronic and is more likely to be a permanent injury. Although it is often soft tissue injury, in severe cases it may be more complex involving the intervertebral joints discs, ligaments, joints, vertebrae, blood vessels, nerves, muscles. The cervical spine is most commonly affected but trauma can be produced in various body regions including the lumbar spine and the brain. Cervical or lumbar discs may abruptly herniate into the nerve roots or spinal cord space. There can be brain injury which occurs during the acceleration/deceleration part of the mechanism. There does not have to be loss of consciousness nor direct trauma to suffer brain trauma. This can account for post concussive symptoms such as headache, photophobia, confusion, fatigue, tinnitus [ringing in ears], difficulty concentrating and loss of memory such as Max had. Many symptoms can occur immediately, or take hours, days or even months.
Symptoms may include the following:

- Neck pain
- Headaches
- Limited range of motion of the neck
- Pain in the shoulder or between the shoulder blades
- Low back pain
- Jaw pain
- Pain and numbness in the arms and/or hands (radiculopathy)
- Vertigo
- Difficulty swallowing
- Vision problems
- Tinnitus
- Memory problems
- Difficulty concentrating
- Irritability, sleep disturbances, fatigue
- Muscle spasms

The following chart is a commonly used standard of grading whiplash which was developed by the Quebec Task Force (Spitzer WO, Skovron ML, Salmi LR, Cassidy JD, Duranceau J, Sussa S et al. Scientific monograph of the Quebec Task Force on Whiplash-Associated Disorders: redefining "whiplash" and its management. Spine 1995; 20(8 Suppl):1S-73S).

<table>
<thead>
<tr>
<th>Grade</th>
<th>Clinical Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No neck complaints, no physical signs</td>
</tr>
<tr>
<td>1</td>
<td>Complaints of neck pain, stiffness or tenderness. No physical signs.</td>
</tr>
<tr>
<td>2</td>
<td>Neck complaint and musculoskeletal signs</td>
</tr>
<tr>
<td>3</td>
<td>Neck complaint and neurological signs</td>
</tr>
<tr>
<td>4</td>
<td>Neck complaint and fracture/dislocation</td>
</tr>
</tbody>
</table>

**Unexpected or “Hidden” Injuries**

Some of the symptoms from whiplash injury are obvious. But there are other, less obvious injuries that may occur weeks or months later, even in what appears to be minor accidents. They are often more difficult to recognize and relate to the accident. It is essential to establish any prior injuries, ongoing medical conditions such as diabetes and overall physical and mental health prior to the accident to help associate if there are any “hidden injuries”. These include but are not limited to:

- Brain injury
- Degenerative disc disease
- Atlas (C1) vertebra injury
- Peripheral neuropathy.
- Vertebrobasilar insufficiency
- Brachial plexopathy
- Dizziness and otoneurological disorders
- Thoracic outlet syndrome
- Oculomotor or other visual disturbances
- Post-traumatic stress disorder
- Herniation of cervical discs; rupture of ligaments and adjacent tissues
- Rim lesions (disc/bone interface)
- Spinal cord injury
- Damage to subarachnoid space
- Mediastinitis
- TMJ (temporomandibular joint injury)
- Hypopharyngeal, tracheal or esophageal damage
- Hypothyroidism
- Tremor and movement disorders
- Occipital neuralgia
- Cervical dystonia
- Fibromyalgia syndrome
- Allergy
- Breathing disorders
- Cardiovascular disorders
- Lumbar spine injury

**Testing**

There are no truly diagnostic tests for whiplash but there are studies which may show structural damage related to whiplash or to rule out other conditions such as fracture, infection, tumor, or arthritis. Special advanced testing such as high field strength and upright MRI improves the chances of visualizing damage. The absence of damage on these tests does NOT indicate there is no injury. Diagnosis should be based on patient symptoms and examination.

**X-ray** - This test helps rule out broken bones or other conditions, such as a spinal fracture, arthritis or dislocations. Usually first test performed but is very limited in it’s usefulness.

**CT (computerized tomography) scan** - Many X-ray images are taken which allow the radiologist to see slices of bone tissue. The machine uses a computer and x-rays to create these slices. Although some soft tissue anatomy can be visualized, it is used primarily when problems are suspected in the bones.

**MRI (magnetic resonance imaging) scan** - The MRI machine uses magnetic waves rather than x-rays to create pictures of the cervical spine in slices. MRIs show the cervical spine vertebrae, as well as the soft tissue structures, such as the discs, joints, and nerves. Radio waves and a strong magnetic field gradually produce a detailed picture of the affected area on a monitor. Find out if the MRI was done in 1.5 or 3 tesla. High field strength such as with 3 tesla provides enhanced resolution of images enabling better identification of injuries.

If not already done, an upright or weightbearing MRI may be helpful. It scans patients in normal weight-bearing positions including sitting, standing, leaning, bending or laying down. This reveals otherwise hidden pathology on traditional non weight-bearing MRI’s.

**EMG/NCV (Electromyography and nerve conduction velocity)** - Tiny needle electrodes are inserted into the muscles of the affected arm or leg when there is suspicion that a nerve is being trapped (such as in carpal tunnel syndrome) or there is possible nerve damage.
Bone Scan - A bone scan is used to help locate the affected area of the spine. A radioactive chemical is injected into the bloodstream which attaches itself to areas of bone that are undergoing rapid changes. These areas appear as dark areas on the film.

SPECT (Single Photon Emission Computed Tomography) – This scan produces a three-dimensional image (tomographic) which shows how blood flows to tissues and organs. It integrates computed tomography (CT) and a radioactive material (tracer). It is useful in identifying areas of brain injury as well as fractures in the spine.

PET (Positron Emission Tomography) – A 3D scan similar to the SPECT, but it is faster and provides higher resolution. It is more expensive than the SPECT scan.

Case Management

The most challenging task is to establish rock solid proof of injury. An in-depth client interview is critical to obtain a detailed history of the accident and both current and pre-existing health problems. A simple tool we use on these cases is the neck pain disability index (Vernon H. The neck disability index: patient assessment and outcome monitoring in whiplash. Journal of Musculoskeletal Pain 1996;4(4):95-104). Although it is not an official document, it will assess the impact of their pain on their daily activities, quantifying their neck pain which assists to determine the severity of disability. If any of their complaints or symptoms seem suspicious for brain injury then the interview includes the brain injury questionnaire which will direct if there is need for further testing by a neuropsychologist.

Other factors may play a role so questioning should also include:

- Position of the injured person’s head at the time of impact
- Posture at impact (bent down or sitting up?)
- Overall physical condition
- Current symptoms and level of function
- Psychological state
- Previous medical and surgical history
- Alcohol or drug intoxication
- Medications and effectiveness
- Awareness of coming impact
- Seating position
- Height and gender
- Age
- Position of head restraints
- Use of seatbelts
- Relative size and weight of the vehicles involved

The information can help identify if there is a need for referral to specialists or for advanced diagnostic techniques, testifying experts needed and also gives an idea for future treatment needs.

With chronic whiplash, long-term pain makes it more difficult for the patient to enjoy life, including carrying out many everyday chores. In some cases the chronic pain can be traced back to joint, disk or ligament damage. For some, the cause of the pain is never found and their life has been changed forever.