

Peter Lim

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A review of osteopahtic treatments for chronic whiplash disorder by maintenance and preventative treatments for the muscles of the neck.

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## **Introduction of the Medical Condition (physiology/pathology/anatomy)**

The following section will bring forth the discussion of the neck tissues involved in regards to whiplash.

### **Structures involved in whiplash**

According to Rattray, “a whiplash is an acceleration-deceleration injury to the head and neck.” (Rattray, 2000, pg 379). Pain from this condition may be caused by the surrounding tissue going into spasm because of trauma related injury to the cervical spine and the surrounding structures. The cervical spine plays a very important part in everyday posture, and therefore, dysfunctional movement can cause a patient to experience a lot of pain.

Structures of the neck, upper thorax and head may be injured as a result of whiplash (Rattray, 2000). The focus of this study will be directed on the muscles of the neck and cervical spine. The muscles of the neck are comprised of anterior and posterior portions. The anterior portion consists of: rectus capitis anterior, longus capitis, longus colli, sternocleidomastoid, mylohyoid, omohyoid, supra and infrahyoid, and platysma. The posterior cervical muscles consist of: suboccipitals, rotators, multifidi, semispinalis cervicis, longissimus cervicis, upper trapezius, and levator scapulae. The lateral cervical muscles consist of: rectus capitis lateralis, and anterior, medial and lateral scalenes.

The cervical spine is made up of seven vertebrae, which are considered to be synovial gliding joints. There are four typical and three atypical cervical vertebrae. The typical vertebrae, C3-C6, have bodies that are broader from side to side. The superior portion of the body is concave, and the inferior portion is convex, which helps with articulation with the inferior cervical body. The pedicles are attached to the body posteriorly and lateral. The lamina is thin and projects medially and posteriorly joining itself to the spinous process. Developing from the lamina and the pedicle are the lateral masses, which create the zygapophyseal joint and aids in superior and inferior articulation. The orientation of the articulating surfaces allows the cervical spine to move in a flexion-extension, rotation, and lateral flexion plane. The transverse process is located most lateral on both sides of the body. Each transverse process has its own foramina, which allows the spinal nerves to exit to the peripheral body. At each typical cervical segment, nerve roots exit through short tunnels called intervertebral foramen. Each foramen is about 4mm in diameter and decrease in size gradually to the junction of C6-C7.

The first, second, and seventh cervical vertebrae are considered to be atypical. The first cervical vertebra, also known as the atlas, does not have a body and spinous process. It has a ring-like structure in the middle which articulates with the dens of cervical two. Cervical two, also known as the axis, has a body that is deeper anteriorly than posteriorly. It also extends downward anteriorly to overlap the upper and front part of the third vertebra. The seventh cervical vertebra's key feature is its long spinous process, which is also known as vertebral prominens (Malanga 2002).

There is currently a lot of controversy surrounding the concept of whiplash. The term is most often used to describe an injury due to a rear-end motor vehicle accident. While this phrase usually applies to high impact accidents, the controversy is that even

low-speed impact causes injury. There has been research done to provide more information on collisions occurring when a vehicle has fully stopped, and when it is hit at a lower traveling speed (Hanley & Belfus, 2002).

According to Foreman and Croft, there are different ways to classify and assess whiplash. This includes grades 1 to 5, where 1 is minimal with no pain and no neurological findings, and ranging to a 5, which is severe and requires surgical management or stabilization. There are also stages 1 to 4, in which the body is able to go from acute injury to a chronic permanent stage. Lastly, there are three types of collisions: rear, side and front. Depending on how the impact of the accident occurred, the assessment of the injury is quite specific to the type of treatment needed.

### **Common Medical Interventions**

There are various treatments for whiplash including chiropractic, medical doctors, physiotherapy and massage therapy and other manual therapies.

Chiropractors use either mechanical-force, manually-assisted, or high-velocity short-amplitude chiropractic thrust manipulations in the treatments of whiplash disorders. This includes long-axis mobilizations of the mid-thoracic spine, high-velocity thrusts to the cervicothoracic junction, all to take pressure off the sensitive cervical joints. The goal of the manipulation is to restore structural alignment to the spine as well as improve joint motion. Spinal manipulation is a hands-on technique where the therapist identifies restricted joints or those that have abnormal joint motion. The therapist thrusts into the joint resulting in a fast stretch to the soft tissue and stimulates the nervous system to return motion to the spine. The manipulation usually results in an audible release of gas from the spine.

Joint manipulation can be achieved with mechanical means such as flexion-distraction tables and instrument-assisted manipulations. The principle of flexion-distraction is to restore the loss of intervertebral disc height. Instrument-assisted manipulation utilizes a hand-held instrument that applies force without the manual thrust from the hands of the therapist.

Medical doctors claim to have the symptoms completely resolved with the following treatments: heat therapy to the hypertoned muscles to help bring extra circulation and help ease the sympathetic nervous system, pain medications (NSAIDS), muscle relaxants, and range of motion exercises with physiotherapy (Albert, 2014). Ice is also primarily recommended to help reduce swelling and pain and should be used initially. Treatments also include a neck brace or collar if needed; this will add support but is never recommended for a long period of time.

The physiotherapy treatments include active exercises, electrotherapy, ultrasound therapy and manual therapy. Using these techniques in conjunction with the patient continuing home care exercises will result in a reduction of pain and disability. In another study done by physiotherapists,

“There is a 50% chance that symptoms will get better after 6 weeks. If there are still symptoms at this stage, then these are likely to continue on and off for 6 to 18 months. There is also about a one-in-three chance that there will be a chronic problem with neck pain, stiffness and headaches coming back from time to time”

[http://www.surgerydoor.co.uk/medical\\_conditions/Indices/W/whiplash\\_injury.htm](http://www.surgerydoor.co.uk/medical_conditions/Indices/W/whiplash_injury.htm)).

Osteopathic and manual techniques can be part of an effective treatment plan for a whiplash injury to the cervical spine. Osteopathic practitioners can use a variety of techniques in treatment for this condition. Some of these treatments include: joint mobilization, circulatory techniques, hydrotherapy, remedial exercise, stretching, trigger point release therapy, myofascial release and some physiotherapy modalities such as electrotherapy. Using these techniques, osteopathic practitioners can restore regular normal range of motion in the cervical spine without pain.

One of the first goals looked at when treating the cervical spine is to decrease pain to the neck and shoulders, as well as to decrease the hypertonicity in the posterior neck that often develops because of the whiplash. Muscles such as upper trapezius, levator scapulae, subscapularis and the sub-occipital muscles need to be addressed. A variety of techniques with these muscles can be used, including myofascial release and trigger point therapy. Once muscle length and tone are restored, muscles in the cervical spine will stay in their normal anatomical position when mobilized.

Active stretching throughout the treatments and then follow up with stretching at home of the upper trapezius and levator scapulae will help to increase mobility and length of the muscle. Strengthening exercises focusing on posterior neck muscles will help with weakness. Also, strengthening lower trapezius and rhomboids will aid in decreasing head forward posture.

Trigger point therapy generally is very beneficial to the anterior and posterior neck muscles. In the case of trigger point therapy, it is mainly used on upper trapezius, levator scapulae, anterior, middle and posterior scalenes, sternocleidomastoid, and longus coli. Myofascial release will also be beneficial to these muscles, especially for the anterior neck muscles, which include: suprahyoid, infrahyoid, pectoralis major, longus coli; and the posterior neck muscles, which include: upper and lower traps, levator scapulae, rhomboids major and minor.

Soft tissue therapy is used to increase local circulation to remove waste products in weak and tight structures. It is also used to reduce muscle tension and trigger points as well as to stretch shortened muscles. Soft tissue therapy helps to restore muscle imbalances, thus retaining normal alignment.

If the area being treated is too sensitive to even touch, electrotherapy techniques can be used. Techniques including the use of TENS and interferential machines can help break the pain cycle so the brain won't be able to interpret the pain receptors. Laser and ultrasound techniques can help break up scar tissue so increased blood flow and mobility can occur. Once the area becomes less sensitive, techniques such as mobilization of the cervical area can help stretch the ligaments in the spine and help relieve some pressure as well. Stretching the ligaments can give the facet joints some space so some relief can finally happen. The goal is to help manage the pain and try to improve mobility to the client.

The use of muscle energy technique is also very effective to help manage hypertoned muscles and hypomobile joints in the neck. Muscle energy technique (MET) is a "direct manual technique that uses a voluntary contraction of the [client's] muscles against a distinctly controlled counterforce from a precise position and in a specific direction" (Numss, 2015). By using MET, the golgi tendon organ are activated by

directly inhibiting the agonist muscle. Then a reflexive reciprocal inhibition occurs at the antagonist muscle, which will result in the muscle relaxing and an improved range of motion.

Remedial exercise consisting of awareness of good posture is beneficial to the client with whiplash. Sitting at a desk, watching TV, eating dinner, and other activities of daily living should all be noted with awareness. Therapeutic exercise is very important because the therapist can only be responsible for a small percentage of the client's well-being. Allowing the client to go home with effective home care exercises will give the client the push they need to get better. Practitioners are tools to help patients improve, but it takes the will of the client to complete it and get well.

The therapist's aim is to ensure the patient's posture is ideal. Ideally the head should be held straight with the chin tucked in. The earlobes should be in line with the middle of the shoulders. The shoulder blades should be close together and the knees should be straight with the stomach tucked in while the pelvis is in neutral position.

### **Etiology and Pathology**

Whiplash is commonly associated with any hyperflexion-extension injury. The mechanism of injury is an acceleration-deceleration incident such as that which may occur in motor vehicle accidents or with sporting activities, such as football or rugby. The injury is caused by sudden acceleration and deceleration of the head relative to the trunk. Whiplash injuries are most commonly found when a vehicle is at rest and a low-impact rear-end collision (5-12km/h) occurs.

Experiments with cadavers affirm that "upon impact, the lower cervical spine is thrust upwards and forwards. . . As a result, the cervical spine assumes an S shape during the first 50-75ms after impact . . . all segments are progressively extended until the head is thrown backwards into extension" (Malanga, 2002, pg.42). It also suggests that the occipital neck muscles are injured due to the over-stretch of the dorsal root ganglia (C1-C2). Biomechanical studies show that both flexion and rotational movements of the spine occur in addition to hyperextension. Studies using high-speed photography and volunteers has shown that after a rear-end impact, the body for a short time does not move, while the seat moves forward. Soon afterwards, the hips would move forward, then the lumbar and thoracic spine, then finally the cervical neck, giving the "whiplash" recoil movement. Again, there is emphasis on the compression of the lower cervical spine (Malanga, 2002).

Other factors include: length of the patient's neck, weight of their head, general health, activities of the patient, headrest positioning in the vehicle, direction of impact, awareness of the collision, and previous neck injuries.

### **Research Findings**

There are studies on the effects of whiplash especially when pain is involved. Examples of factors like general health and the height of the head rest in the vehicle can affect the severity of the whiplash injury. Having the proper mindset to have good general health is beneficial to all patients. Maintaining correct head rest height is also

very important, because it will diminish the severity of the whiplash during a rear-end collision.

Further research is needed on the effects of soft tissue therapy in whiplash injury to the neck. There is proof of chiropractic and physiotherapy having a beneficial effect on this condition but there have not been many studies on the effects of massage therapy on whiplash. As previously discussed, whiplash injury can be relieved with chiropractic adjustments and osteoarthritis can be controlled with regular stretching, strengthening and range of motion exercises. However, large and well-controlled randomized clinical trials are needed to develop optimal pain management for whiplash, but these types of experiments will be quite difficult to find because of the specificity of every case.

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