Whiplash Associated Disorders: The pathway from acute to chronic pain

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Learning Objectives

• Determine patient’s prognosis (acute pain versus chronic pain) following a whiplash injury prior to providing chiropractic services.
Whiplash Neck Injury

• First described by Crowe in 1928.
• Most common type of injury following motor vehicle crashes
• Usually 2-3 weeks for recovery
• Up to 42% transition from acute to chronic pain status.(1)
Persistent Pain: A Chronic Illness

• Acute pain usually goes away after an injury or illness resolves. But when pain persists for months or even years, long after whatever started the pain has gone or because the injury continues, it becomes a chronic condition and illness in its own right.

National Pain Strategy

• *Chronic pain* - Pain that occurs on at least half the days for six months or more.
Quebec Task Force Definition

- Whiplash injury is “an acceleration-deceleration mechanism of energy transferred to the neck,” usually resulting from rear-end or side-impact motor vehicle collision. (2)
How whiplash occurs

Motorists involved in rear-end crashes commonly experience whiplash. Injuries to the neck occur as the torso accelerates forward and the neck lags, then the head whips forward.

1. During normal driving, the head and torso move relative to the vehicle.

2. As the vehicle is struck from behind, the head tilts backward.

3. After the initial impact, the head snaps forward.

The torso rebounds.

The torso rises up.

Vehicle traveling forward.
Whiplash Injury Costs

- Queensland, Australia = $500 million Australian dollars (1994-2001)

- United Kingdom = L3 billion per annum

- United States = USD $29 billion per annum
Pathomechanics of Whiplash Injury

Whiplash Injury Symptoms

• Pain,
• dizziness,
• visual and auditory disturbances,
• temporomandibular joint dysfunction,
• photophobia,
• dysphonia,
• dysphagia,
• fatigue,
• cognitive difficulties such as concentration and memory loss, anxiety, insomnia, and depression (3)
Diagnosis and prognosis are the keys to successful treatment of whiplash associated disorder.
Quebec Task Force (QTF) Classifications

• Sponsored by a public insurer in Canada.

• QTF submitted recommendations regarding classification and treatment of WAD, which was used to develop a guide for managing whiplash in 1995.

• An updated report was published in 2001.

• Each of the grades corresponds to a specific treatment recommendation.
Quebec Task Force (1995) Criticisms

1. Largely consensus based rather than evidence-based
2. Selection bias for the literature review
Swedish Study and Quebec Task Force

• Neither the WAD classification nor the QTF follow-up regimen could be linked to a better outcome.

• Jouko Kivioja, Irene Jensen, and Urban Lindgren. Neither the WAD-classification nor the Quebec Task Force follow-up regimen seems to be important for the outcome after a whiplash injury. A prospective study on 186 consecutive patients. Eur Spine J. 2008 Jul; 17(7): 930–935.
Swedish Study and Quebec Task Force

• The multiple-follow-up regimen is both time consuming and costly and appears not be justified in a routine clinical setting.
Swedish Study and Quebec Task Force

• The WAD-classification could not predict persistent neck pain after a whiplash injury in this hospital emergency department based population.
Swedish Study and Quebec Task Force

• Nor was there a statistically significant difference in the rate of chronic neck pain between the no-follow-up regimen and the multiple-follow-up regimen proposed by the QTF.
• At the first visit we recommend a careful history, physical examination and information about the nature of the condition.
Swedish Study Findings

• In this study cases with neck pain before the accident and a high degree of emotional distress from the accident had a tenfold increased risk of developing chronic neck pain. (4)
Transition from Acute to Chronic Pain Status

• Patients that do not resolve within weeks often exhibit a myriad of symptoms soon after the injury event.
Physical and Psychological Features

- Poor outcomes at 2-3 years post injury
  - High pain and disability levels with physical and psychological factors
  - Early presence of cervical movement loss, cold temperature hyperalgesia, and posttraumatic stress symptoms
Whiplash Presentation

• “Whiplash is a markedly heterogeneous and complex condition with varied disturbances in motor, sensorimotor and sensory function as well as psychological distress.”
Pathoanatomical Lesions in the Whiplash Injury

1. Cervical Facet joints (Zygapophyseal Joints)
2. Dorsal Root Ganglion (DRG) and Nerve Roots
3. Cervical Ligaments
4. Intervertebral Disc Injuries
5. Muscle Injuries
6. Fractures
Upper Cervical Ligament Sprain Injuries Leading Chronic Pain

• Severity of alar ligament injury, head position at time of impact, Neck Disability Index (NDI) scores and reproduction of pain and excessive mobility with manual examination. (7, 8)

• Sharp Purser Maneuver test for upper cervical spine instability.
Sensorimotor Dysfunction and Whiplash Injury: Clinical Implications and Prognosis

- Kinesthetic deficits (joint position error)
- Cervical muscle recruitment patterns
- Altered activity in upper trapezius muscle
- Poor control of balance
- Impaired eye movement (13-17)
Sensorimotor Dysfunction and Chronic Whiplash Associated Disorders

• Loss of balance and disturbed neck-influenced eye movements with chronic WAD
• Greater joint repositioning errors with chronic WAD and acute with more severe pain and disability

Testing for Joint Positioning Error and Kinesthetic deficits

Target distance is 90 CM
Beyond the yellow area is a significant error. (18)

Oculomotor Control

The assessment of smooth pursuit and gaze stability is an important part of the assessment of sensorimotor impairment following whiplash injury.
Gaze Stability Testing

• Ask patient to look at an object roughly arm’s-length from their face and to slowly flex and extend their head and neck or gently rotate their head and neck whilst keeping their eyes still.

• Reproduction of symptoms or difficulty performing the test suggests sensorimotor impairment.
Sensorimotor Ocular Testing

• Reproduction of dizziness or pain, increased effort or difficulty performing the test all suggest sensorimotor impairment.
Sensorimotor Dysfunction

• Disturbance in Cervicobrachial Muscle Activation
  • Active cervical ROM restrictions
  • Short and long-term deficits
  • Altered patterns of muscle recruitment in cervical spine and shoulder girdle (11, 12)
Cervical muscle recruitment patterns

• Cranio-cervical flexion test attempts to determine the strength/weakness of the deep flexor muscles of the cervical spine (Longus capitis and colli)

• Eliminating the influence of the superficial neck flexors (Sternocleidomastoideus and anterior scalene)
Early Sensory Findings after Whiplash Injuries

- Brachial plexus provocation test
- Pressure pain thresholds
- Thermal pain thresholds
- Sympathetic vasoconstrictor reflex
- Neck disability index (19)

Late Sensory Findings and Chronic Whiplash Syndrome

- Muscular hyperalgesia
- Large referred pain areas
- Possible neurogenic pain
- Findings suggest a generalized central hyperexcitability in patients suffering from chronic whiplash syndrome

- Koelbaeck JM. Generalised muscular hyperalgesia in chronic whiplash syndrome. Pain. 1999 Nov;83(2):229-34
Algometry with Clothes Peg
Characteristics of the Whiplash Presentation

• Sensory Function Disturbances
  • Hypersensitivity (decreased pain threshold) to pressure, thermal, electrocutaneous
  • Spinal cord hypersensitivity (central sensitization)

Psychological Factors and Chronic WAD

• Affective disorders
• Anxiety
• Depression
• Behavioral abnormalities (fear of movement)
• Posttraumatic stress
Post-Whiplash Pain and PTSD

- When pain is secondary to motor vehicle accidents, up to 50% of individuals meet the diagnostic criteria for PTSD.

Post Whiplash Injury Muscle Fatty Infiltrates

• Muscle fatty infiltrates on MRI develop soon after the whiplash event (between 4-weeks and 3-months) but only in those with higher initial pain levels and a subsequent post-traumatic stress response (PTSD).

Degeneration of the Cervical Extensor Musculature in Chronic WAD

Content not quantity is a better measure of muscle degeneration in whiplash.

Clinical Implications

• The observed changes in motor function, sensory disturbance, and psychological distress occur very soon following the whiplash event and remain unchanged (2–3 years post-MVC) only in those patients who report moderate/severe pain and disability.

Conclusions

• Evidence now exists to show that whiplash can, in some patients, involve a complex chain of debilitating changes in muscle tissue and motor, sensory, and psychological functioning, regardless of pathoanatomical features.

Recommendations when treating patients with whiplash injuries.

- Discover mechanism of injury
- Determine history of neck pain prior to whiplash injury
- Reveal pain severity with Numerical Pain Rating Scale (NPRS)
- Identify the injured tissues and pain generators
- Understand biopsychosocial factors
- Perform differential diagnosis
- Determine a reasonable prognosis
- Offer appropriate treatment with the use of a team of health care providers
- Avoid nocebo effect and promote placebo effect...
References


References


Thank You!
Cranio-cervical Flexion Test

• Performed with the patient in supine crook lying with the neck in a neutral position (no pillow) such that the line of the face is horizontal and a line bisecting the neck longitudinally is horizontal to the testing surface. Layers of towel may be placed under the head if necessary to achieve a neutral position. The uninflated pressure sensor is placed behind the neck so that it abuts the occiput and is inflated to a stable baseline pressure of 20 mm Hg, a standard pressure sufficient to fill the space between the testing surface and the neck but not push the neck into a lordosis. The device provides the feedback and direction to the patient to perform the required five stages of the test. The patient is instructed that the test is not one of strength but rather one of precision. The movement is performed gently and slowly as a head nodding action (as if saying “yes”). The CCFT tests the activation and endurance of the deep cervical flexors in progressive inner range positions as the patient attempts to sequentially target five, 2-mm Hg progressive pressure increases from the baseline of 20 mm Hg to a maximum of 30 mm Hg as well as to maintain a isometric contraction at the progressive pressures as an endurance task.