

## **A review of the otological aspects of whiplash injury**

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### FROM ABSTRACT

Approximately 10% of patients who have suffered with whiplash injury will develop otological symptoms such as tinnitus, deafness and vertigo.

Some of these are purely subjective symptoms; nevertheless, for the majority there are specific tests that can be undertaken. These tests can quantify the extent and severity of the symptoms as well as provide guidance as to the correct rehabilitation pathway

### THESE AUTHORS ALSO NOTE:

Dr. HE Crowe first described "whiplash" injury in 1928 at the Western Orthopaedic Association Meeting in San Francisco.

Whiplash injury has been described as a clinical entity in the First World War as an acceleration extension flexion injury to the neck related to catapult assisted take-offs from aircraft carriers.

"It is perhaps surprising to think that significant injuries can occur following even low speed car collisions but simulated accidents have shown that a 5-mile an hour rear end car collision can result in a positive acceleration of 8.2 G and 4.7 G of the head and chest, respectively. These forces explain the damage that can occur to an unsupported neck."

### HEARING LOSS

"Balance and hearing problems occur in 5-50% of whiplash injuries."

Large studies on whiplash patients show that 15-20% develop "persistent complaints including headache, vertigo, instability, nausea, tinnitus and hearing loss."

Hearing loss, tinnitus and dizziness are otological symptoms that can occur from whiplash injury.

Whiplash injury can cause several types of deafness, including proven high frequency hearing loss.

Legally, "the expert medical witness simply needs to be satisfied that there is at least a 51% chance (the balance of probability) that the claimant's symptoms are attributable to whiplash injury rather than any other cause."

"High frequency hearing loss is the most common form of hearing loss associated with whiplash injury and is easily demonstrated with a pure tone audiogram. This type of hearing loss produces difficulties hearing the high frequency consonant sounds and makes it difficult for the patient to discriminate speech especially in the presence of background noise or when several people are talking."

Some patients with a normal audiogram post-whiplash will complain of hearing difficulties with poor awareness of sound and poor speech discrimination. "Scientific studies have shown that such patients undertaking a specific test called the 'speech and noise test' do not do as well as the normal population'."

"With regard to prognoses the hearing loss will be permanent."

## TINNITUS

"Tinnitus is Latin for ringing." "It is perception of sound in the absence of any corresponding external sound."

The majority of tinnitus related to whiplash is purely subjective.

There is no objective measurement for tinnitus.

There is no traditional medical treatment for tinnitus. [See Comments Below]

The prognosis for the resolution of tinnitus is "very guarded."

## VERTIGO

"Vertigo is a sudden sensation of unsteadiness or that one's surroundings are moving."

The sensation of balance relies on the input of three systems:

- 1) The inner ear vestibular apparatus, the labyrinth and semi-circular canals
- 2) Proprioception sensors
- 3) Vision

Post-whiplash unsteadiness may be due to altered posture to protect the injured neck.

Sophisticated testing such as videonystagmography and posturography can document the lesion.

Following whiplash injuries patients can develop either unilateral or bilateral vestibular damage.

Following whiplash the most common type of vertigo seen is benign paroxysmal positional vertigo (BPPV), "which is characterized by a short duration of vertigo, associated with movement of the head."

"Following trauma the crystals of calcium carbonate in the utricle become displaced and lie within the labyrinthine fluid and in certain positions will stimulate the balance nerve endings in the semi-circular canals causing brief sensations of spinning." The appropriate treatment is a "series of movements of the head which move the loose particles of crystal into the utricle where they will not cause stimulation of the sensitive nerve endings in the semi-circular canals."

Therefore, BPPV is usually curable, but other forms of labyrinthine damage are not so easily managed and may not be curable.

## CONCLUSIONS

"Approximately 10% of patients who have suffered with whiplash injury will develop otological symptoms such as tinnitus, deafness and vertigo."

## KEY POINTS FROM DAN MURPHY

- 1) Approximately 10% of patients who have suffered whiplash injury will develop otological symptoms such as tinnitus, deafness and vertigo.
- 2) "Significant [whiplash-related] injuries can occur following even low speed car collisions."
- 3) "Simulated accidents have shown that a 5-mile an hour rear end car collision can result in a positive acceleration of 8.2 G and 4.7 G of the head and chest, respectively. These forces explain the damage that can occur to an unsupported neck."
- 4) "Balance and hearing problems occur in 5-50% of whiplash injuries."
- 5) 15-20% of whiplash patients develop "persistent complaints including headache, vertigo, instability, nausea, tinnitus and hearing loss."

- 6) "High frequency hearing loss is the most common form of hearing loss associated with whiplash injury and is easily demonstrated with a pure tone audiogram. This type of hearing loss produces difficulties hearing the high frequency consonant sounds and makes it difficult for the patient to discriminate speech especially in the presence of background noise or when several people are talking."
- 7) These authors consider hearing loss for whiplash injury to be a permanent injury.
- 8) The majority of tinnitus related to whiplash is purely subjective, with no objective measurement testing available, and there is no effective medical treatment. [See Comments Below]. Consequently, the prognosis for the resolution of tinnitus is "very guarded."
- 9) The sensation of balance relies on the input of three systems:
  - A)) The inner ear vestibular apparatus, the labyrinth and semi-circular canals
  - B)) Proprioception sensors [very important for chiropractors]
  - C)) Vision
- 10) Post-whiplash unsteadiness may be due to altered posture to protect the injured neck.
- 11) Following whiplash the most common type of vertigo seen is benign paroxysmal positional vertigo (BPPV), "which is characterized by a short duration of vertigo, associated with movement of the head."
- 12) "Following trauma the crystals of calcium carbonate in the utricle become displaced and lie within the labyrinthine fluid and in certain positions will stimulate the balance nerve endings in the semi-circular canals causing brief sensations of spinning." The appropriate treatment is a "series of movements of the head which move the loose particles of crystal into the utricle where they will not cause stimulation of the sensitive nerve endings in the semi-circular canals."
- 13) Therefore, BPPV is usually curable, but other forms of labyrinthine damage are not so easily managed and may not be curable.
- 14) Legally, "the expert medical witness simply needs to be satisfied that there is at least a 51% chance (the balance of probability) that the claimant's symptoms are attributable to whiplash injury rather than any other cause."

## COMMENTS FROM DAN MURPHY

Although this article notes that there is no effective medical treatment for tinnitus, below are three recent interesting non-medical approaches:

1) Burkhard Franz and Colin Anderson

**The Potential Role of Joint Injury and Eustachian Tube Dysfunction in the Genesis of Secondary Meniere's Disease**

International Tinnitus Journal; 2007, Vol. 13, No. 2, pp. 132-137.

This article suggests that tinnitus can be treated by managing dysfunctions of the upper cervical spine joints or TMJ.

2) Tullberg M, Ernberg M.

**Long-term effect on tinnitus by treatment of temporomandibular disorders: a two-year follow-up by questionnaire.**

Acta Odontologica Scandinavica; 2006 Apr;64(2):89-96.

The results of this study showed that TMD symptoms and signs are frequent in patients with tinnitus and that TMD treatment has a good effect on tinnitus in a long-term perspective.

3) Gungor A, Dogru S, Cincik H, Erkul E, Poyrazoglu E.

**Effectiveness of transmeatal low power laser irradiation for chronic tinnitus.**

The Journal of Laryngology & Otology; May 2008

This was a prospective, randomised, double-blind study using a 5 mW laser with a wavelength of 650 nm, or placebo laser, applied transmeatally for 15 minutes, once daily for a week. Loudness improved 49%; Duration of annoyance improved 58%; Degree of annoyance improved 56%. The authors concluded: "transmeatal, low power (5 mW) laser irradiation was found to be useful for the treatment of chronic tinnitus."