



RESEARCH REVIEW

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

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From Abstract

Meniere's disease not only includes the symptom complex consisting of attacks of vertigo, low-frequency hearing loss, and tinnitus but also comprises symptoms related to the eustachian tube, the upper cervical spine, the temporomandibular joints, and the autonomic nervous system.

Quantifiable experience shows that the insertion of a middle-ear ventilation tube can alleviate Meniere's disease symptoms, suggesting that eustachian tube dysfunction is a contributing feature.

Clinical practice also shows that treating disorders of the upper cervical spine and temporomandibular joints can lessen Meniere's disease symptoms, suggesting a relationship.

Similarly, stellate ganglion blocks can be beneficial in controlling Meniere's disease symptoms, highlighting the influence of the autonomic nervous system.

Thus, contrasting symptoms associated with the eustachian tube, the upper cervical spine, the temporomandibular joints, and the autonomic nervous system relate to Meniere's disease, but the possible reflex pathway by which a link is established is unclear.

We made an attempt in this study to describe a hypothetical reflex pathway that links joint injury and the autonomic nervous system, where eustachian tube function is under their influence and is the critical link.

In this hypothetical reflex pathway, irritation of facet joints can first lead to an activated anterior cervical sympathetic system via an independent pathway in the mediolateral cell column; it can simultaneously lead to an axon reflex involving nociceptive neurons, resulting in neurogenic inflammation and the prospect of a eustachian tube dysfunction.

The eustachian tube dysfunction is responsible for a disturbed middle ear-inner ear pressure relationship, circumstances that have the potential to develop into secondary Meniere's disease.

These authors also note:

Classic Meniere's disease is characterized by:

1. Intermittent attacks of vertigo

2. Low-frequency hearing loss

3. Tinnitus

Meniere's disease is also often associated with disorders of the:

1. Cervical spine
2. Temporomandibular joint
3. Eustachian tube
4. Autonomic nervous system

Reducing functional disorders of the cervical spine or temporomandibular joints can improve Meniere's disease symptoms.

Meniere's disease patients often have a blocked ear and a feeling of fluid in the middle ear, suggesting Eustachian tube hypofunction.

Eustachian tube function is important for inner ear integrity, attributing to inner ear pressure sensitivity and to Meniere's disease.

It has been observed for about 5 decades that disorders and/or injury of the cervical spine is involved in Meniere's disease.

"Chiropractic manipulation of disorders of the cervical spine has been successfully used to treat patients with vestibular symptoms."

The cervical spine can be related to Meniere's disease through either vascular or neurological mechanisms:

1. The vascular mechanism includes the observation that the vertebral artery supplies the middle ear, the vestibulocochlear nuclei, and a cervical joint dysfunction could affect the artery and compromise regional blood flow.
2. The neurological mechanism includes that the vertebral nerve which contains the sympathetic control of the vertebral artery "may be irritated by cervical injury and become dysfunctional."

"Sick leave and disability payments are significantly reduced in Meniere's patients who have treatment for the temporomandibular and cervical spine joints."

The trigeminal nerve [Cranial Nerve V] innervates the:

1. Masticatory muscles [temporalis, masseter, medial pterygoid, lateral pterygoid]
2. Tensor veli palatini
3. Tensor tympani

Consequently increased mandibular branch Cranial Nerve V motor activity may result in:

1. Temporomandibular joint dysfunction secondary to hyperactivity of

the masticatory muscles [temporalis, masseter, medial pterygoid, lateral pterygoid].

2. Ineffective Eustachian tube opening secondary to hyperactivity of the tensor veli palatini.

3. Tinnitus secondary to hyperactivity of the tensor tympani.

The middle ear and inner ear receive input from the trigeminal and sympathetic nerves through the tympanic plexus.

"Temporomandibular disorders are likely to be present in Meniere's disease."

A disorder of the autonomic nervous system is a possible cause of Meniere's disease, and an enlarged pupil may be observed on the side of the affected ear. Because clinical improvement in Meniere's disease is noted with cervical sympathectomy or with sympathetic blocks, the indication is that the abnormal physiology is increased sympathetic tone.

The effect of the sympathetic nervous system is believed to be its influence on stria vascularis circulation, or from "sympathetic hyperactivity" that leads to dysfunction through changes of gland secretions in the eustachian tube, and thus could influence middle ear pressure relationships.

The mucosa of the eustachian tube requires lubrication provided by glands that are "under the influence of the sympathetic and parasympathetic innervation." Experimental autonomic nervous system irritation is known to cause eustachian tube dysfunction.

"Unquestionably, the upper cervical spine, the temporomandibular joints, the eustachian tube, and the autonomic nervous system can contribute to the global symptom complex of Meniere's disease."

"It can be demonstrated that Meniere's disease symptoms improve with physiotherapy directed to the upper cervical spine and temporomandibular joints."

Sympathetic irritation can result in enhanced neurogenic inflammation and associated edema in the eustachian tube, rendering the middle ear ventilation difficult. Support for this model includes the frequent Meniere's disease complaint of "having a wet ear."

"An activated sympathetic system could seemingly have an adverse effect on eustachian tube function." **[Important]**

The clinical observation of an enlarged pupil on the side of the affected ear in Meniere's disease patients is due to an activated cervical sympathetic system.

"Though an enlarged pupil is consistent with an activated sympathetic system, indications suggest that it can also be linked to an upper cervical spine disorder." **[Important]**

"Immediate enlargement of the pupil while turning the shoulder [head] is abnormal and points to an irritation in the upper cervical facet joints. This clinical observation links the cervical sympathetic system with the upper cervical spine. Physiological studies support the innervation of the cervical facet joints by sensory and sympathetic neurons."

"Functional disorders of the temporomandibular joints are likely to cause a

functional disorder of the upper cervical spine and visa versa." **[Important]**

The eustachian tube has "quite a remarkable representation of sensory neurons" that can be activated through the mandibular branch of the trigeminal nerve that innervates the temporomandibular joint and upper cervical facet joints.

The sympathetic nervous system can be activated by a neck or temporomandibular disorder, causing eustachian tube neurogenic inflammation "with the consequence of reduced middle-ear ventilation."

"Anatomical studies demonstrate that an independent pathway exists in the mediolateral cell column [IML] of the spinal cord, stretching from C2 to T2." **[Very Important]**

"The anterior cervical sympathetic system sends postganglionic neurons from the upper cervical ganglion, innervating the eye and organs of the ear. Postganglionic [sympathetic] neurons link up with the eustachian tube and inner ear, reaching it via the tympanic plexus and via the labyrinthine artery." **[Important]**

"An upper cervical facet joint disorder (or temporomandibular joint disorder) could simultaneously release inflammatory mediators in the eustachian tube via an axon reflex and activate the anterior cervical sympathetic system, the latter enhancing neurogenic inflammation in the eustachian tube resulting in reduced middle-ear ventilation. This imbalance of a middle ear — inner ear pressure relationship has the potential to develop into secondary Meniere's disease."

Key points from Dan Murphy

1. Classic Meniere's disease is characterized by:
 - A. Intermittent attacks of vertigo
 - B. Low-frequency hearing loss
 - C. Tinnitus
2. Meniere's disease is also often associated with disorders of the:
 - A. Cervical spine
 - B. Temporomandibular joint
 - C. Eustachian tube
 - D. Autonomic nervous system
3. Reducing functional disorders of the cervical spine or temporomandibular joints can improve Meniere's disease symptoms.
4. Meniere's disease patients often have a blocked ear and a feeling of fluid in the middle ear, suggesting Eustachian tube hypofunction.
5. It has been observed for about 5 decades that disorders and/or injury of the cervical spine is involved in Meniere's disease.
6. "Chiropractic manipulation of disorders of the cervical spine has been successfully used to treat patients with vestibular symptoms."
7. Mandibular branch Cranial Nerve V motor activity may result in:
 - A. Temporomandibular joint dysfunction secondary to hyperactivity of the masticatory muscles [temporalis, masseter, medial pterygoid, lateral pterygoid].
 - B. Ineffective Eustachian tube opening secondary to hyperactivity of the tensor veli palatini.