

## **The cervicogenic otoocular syndrome: a suspected forerunner of Meniere's disease**

**International Tinnitus Journal**  
**Vol. 5 No. 2, 1999, pp. 125-30**

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### BACKGROUND FROM DAN MURPHY:

Meniere's disease is a disease of the inner ear, which includes the entire labyrinth (cochlea and semicircular canals). The cochlea is the organ of hearing. The semicircular canal/vestibule is the organ of balance.

The various canals of the inner ear, or labyrinth, contain a fluid known as endolymph. The endolymph pressure normally remains constant. For unknown reasons, increases in the endolymphic pressure may cause dilation and distention of the labyrinth, a condition known as "hydrops," or "endolymphatic hydrops." Most patients with Meniere's disease do have hydrops.

Meniere's disease is characterized by attacks of dizziness, nausea, vomiting, ringing in the ears (tinnitus), a feeling of fullness or pressure in the ear, and fluctuating hearing loss with occasional deafness. A typical attack of Meniere's disease is preceded by fullness in one ear. Hearing fluctuation or changes in tinnitus may also precede an attack. A Meniere's episode generally involves severe vertigo (spinning), imbalance, nausea and vomiting. The average attack lasts two to four hours. Following a severe attack, most people find that they are exhausted and must sleep for several hours. There is a large amount of variability in the duration of symptoms.

In Meniere's disease, the attacks of vertigo can be severe, incapacitating, and unpredictable. Some patients experience "drop attacks" where a sudden, severe attack of vertigo or dizziness causes the patient to fall.

Meniere's disease has a severe impact on people's lives. In acute episodes, Meniere's disease is one of the most debilitating diseases experienced by people who survive any illness. Meniere's disease may persist for decades, and it is generally a chronic disease after its first middle age episode.

The click-evoked electrocochleogram includes measurement of the amplitudes of the cochlear summing potential (SP) and auditory nerve action potential (AP) to derive the SP/AP amplitude ratio. It is well documented that an elevated SP relative to AP may be a positive finding for endolymphatic hydrops in patients with Meniere's disease. Up to 90% of the confirmed Meniere's disease patients have increased SP/AP area ratios relative to the normative values.

FROM ABSTRACT:

Over a period of 4 years, 420 patients were observed with fullness in the ear, episodic vertigo, fluctuating hearing, and tinnitus.

Of them, 182 patients showed normal hearing levels, a mild eustachian tube dysfunction, normal SP/AP ratios, mydriasis [excessive dilation of the pupil] on the side of the affected ear, and a functional disorder of the upper cervical spine. These patients responded to conservative management, particularly physiotherapy.

Additionally, 51 patients showed normal hearing levels, a mild eustachian tube dysfunction, an elevated SP/AP ratio suggesting endolymphatic hydrops, mydriasis on the side of the affected ear, and a functional disorder of the upper cervical spine. These patients were given a diagnosis of cervicogenic otoocular (COO) syndrome. Within this group, 43 patients did not respond to preceding conservative management, and 3 patients developed Meniere's disease within 12 months. Also within this group, 8 patients responded to physiotherapy only, with return of the SP/AP ratio to normal levels.

A total of 187 patients had a sensorineural hearing loss, an elevated SP/AP ratio, mydriasis on the side of the affected ear, and a functional disorder of the upper cervical spine; 186 had a mild eustachian tube dysfunction and had diagnosed Meniere's disease.

The COO syndrome is suspected to be a forerunner of Meniere's disease.

THESE AUTHORS ALSO NOTE:

A 1966 study linked eustachian dysfunction to endolymphatic hydrops and Meniere's disease.

A 1965 study linked dysfunction of the autonomic sympathetic nervous system to endolymphatic hydrops and Meniere's disease.

"A functional disorder of the cervical spine frequently is found in patients suffering from Meniere's disease."

These authors suggest that Meniere's disease involves three interdependent physiological phenomenon:

- 1) Eustachian tube dysfunction.
- 2) Dysfunction of the autonomic [sympathetic] nervous system:  
 "The function of the autonomic nervous system was assessed by observing patients' pupils." The patient sat in a swivel chair and pupil size was observed and recorded. While the patients' head remains fixed, the shoulder was rotated back on the side of the affected ear. "An immediate increase of the pupil diameter [mydriasis] is regarded as positive" for autonomic sympathetic dysfunction. "During

this maneuver, with the head in a fixed position, the cervical sympathetic neurons are activated, leading to this abnormal pupil reaction.”

### 3) A cervical spine disorder:

Function of the cervical spine was assessed with special attention given to the facet joints: this included postural assessment, active and passive ranges of motion.

In evaluating 420 patients suffering from ear fullness, episodic vertigo, fluctuating vertigo and tinnitus, they discovered that nearly every patient suffered from neck and/or back symptoms and that 60% had a history of whiplash injury.

“The character of the tinnitus ranged from a mild buzzing to clicking and banging noises in the affected ear.”

Nearly every patient, before they progress to Meniere’s disease, will have dysfunction of the C1-C2 joints and pupil dilation with posterior shoulder rotation (while the head is fixed), yet their hearing will be normal. Patients with Meniere’s disease will have the same upper cervical joint and pupil findings, but their hearing will be abnormal.

“A functional disorder of the upper cervical spine plays an important part” in Meniere’s disease, especially in patients with normal hearing levels.

There is a close relationship between the upper cervical [sympathetic] ganglion and C1-C2 spinal nerves. The C1-C2 facet joints are innervated by the C1 and C2 anterior primary rami. Posterior rotation of the shoulder with the head in a fixed position will activate a cervical sympathetic reflex if the joints of the upper cervical spine are dysfunctional.

It has been known since 1957 that the sympathetic nerves innervate the eustachian tube. These authors speculate that a eustachian tube dysfunction can upset the balance of the fluid compartments in the inner ear.

The functional disorder of the upper cervical spine is regarded as a potential threat to the eustachian tube, leading to a dysfunction that upsets the function of the inner ear.

### KEY POINTS FROM DAN MURPHY:

#### BACKGROUND:

Meniere’s disease is a disease of the inner ear, which includes both balance and hearing.

The various canals of the inner ear contain a fluid known as endolymph. The endolymph pressure normally remains constant. For unknown reasons, increases in the endolymphic pressure may cause dilation and distention of the labyrinth, a

condition known as “hydrops,” or “endolymphatic hydrops.” Most patients with Meniere’s disease have hydrops.

Meniere's disease is characterized by attacks of dizziness, nausea, vomiting, ringing in the ears (tinnitus), a feeling of fullness or pressure in the ear, and fluctuating hearing loss with occasional deafness. A typical attack of Meniere's disease is preceded by fullness in one ear. Hearing fluctuation or changes in tinnitus may also precede an attack. A Meniere's episode generally involves severe vertigo (spinning), imbalance, nausea and vomiting. The average attack lasts two to four hours. Following a severe attack, most people find that they are exhausted and must sleep for several hours. There is a large amount of variability in the duration of symptoms.

In Meniere’s disease, the attacks of vertigo can be severe, incapacitating, and unpredictable. Some patients experience “drop attacks” where a sudden, severe attack of vertigo or dizziness causes the patient to fall.

Meniere's disease has a severe impact on people's lives. In acute episodes, Meniere's disease is one of the most debilitating diseases experienced by people who survive any illness. Meniere's disease may persist for decades, and it is generally a chronic disease after its first middle age episode.

- 1) These authors propose that there is a functional relationship between the upper cervical spine, the pupil of the eye, and the inner ear. Dysfunction of this relationship can be a forerunner that leads to Meniere’s disease. They refer to this as the “cervicogenic otoocular syndrome” (COO).
- 2) A 1966 study linked eustachian dysfunction to endolymphatic hydrops and Meniere’s disease.
- 3) A 1965 study linked dysfunction of the sympathetic nervous system to endolymphatic hydrops and Meniere’s disease.
- 4) It has been known since 1957 that the sympathetic nerves innervate the eustachian tube.
- 5) Eustachian tube dysfunction can upset the balance of the fluid compartments in the inner ear.
- 6) Meniere’s disease involves three interdependent physiological phenomenon:
  - A)) Eustachian tube dysfunction
  - B)) Dysfunction of the sympathetic nervous system:
  - C)) A cervical spine disorder
- 7) “The function of the autonomic [sympathetic] nervous system was assessed by observing patients’ pupils.” The patient sat in a swivel chair and pupil size was

observed and recorded. While the patients' head remains fixed, the shoulder was rotated back on the side of the affected ear by swiveling the chair. "An immediate increase of the pupil diameter [mydriasis] is regarded as positive" for sympathetic dysfunction. "During this maneuver, with the head in a fixed position, the cervical sympathetic neurons are activated, leading to this abnormal pupil reaction."

8) There is a close relationship between the upper cervical [sympathetic] ganglion and C1-C2 spinal nerves. The C1-C2 facet joints are innervated by the C1 and C2 anterior primary rami. Posterior rotation of the shoulder with the head in a fixed position will activate a cervical sympathetic reflex if the joints of the upper cervical spine are dysfunctional.

9) "A functional disorder of the cervical spine frequently is found in patients suffering from Meniere's disease."

10) Nearly every patient suffering from ear fullness, episodic vertigo, fluctuating vertigo and tinnitus also suffered from neck and/or back symptoms and 60% have a history of whiplash injury.

11) Nearly every patient, before they progress to Meniere's disease, will have dysfunction of the C1-C2 joints and pupil dilation with posterior shoulder rotation (while the head is fixed), yet their hearing will be normal. Patients with Meniere's disease will have the same upper cervical joint and pupil findings, but their hearing will be abnormal.

12) "A functional disorder of the upper cervical spine plays an important part" in Meniere's disease, especially in patients with normal hearing levels.

13) The functional disorder of the upper cervical spine is regarded as a potential threat to the eustachian tube," leading to a dysfunction that upsets the function of the inner ear.

