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Environmental Impacts on Vestibular Disorders

By Dr. Matthew G. Crowson, MD

Have you ever wondered if vestibular disorders and their symptoms are influenced by the environment? Recent work has demonstrated that the symptoms of common vestibular disorders may be linked with certain environmental factors.

ATMOSPHERIC PRESSURE

Changes in atmospheric pressure may affect patients with Mènière's Disease.[1]

In a recent study, investigators from Germany asked their patients with Mènière's Disease to keep a daily vertigo diary to document symptom flares. To test a hypothesis that changes in the weather solicit symptom flares, the study's investigators logged local hourly air pressure, as well as absolute and dew point temperatures over the time period the patients recorded symptoms in their vertigo diaries.

Interestingly, they found that the mean change in air pressure differed one day prior to onset of their patients' reported Mènière's Disease symptom flare.

Specifically, the authors noted an increase in symptoms after increase in air pressure, but not after a decrease in air pressure. This result was independent of the temperature and dew point measurements.

As there is little evidence published to date to suggest how an increase in air pressure might trigger Mènière's Disease symptoms, the proposed mechanism of atmospheric pressure change causing increased symptom flares in Mènière's Disease patients' warrants further exploration. The authors correctly point out that atmospheric pressure increases may affect other physiologic processes that result in a symptom flare, so it is possible there is an alternate, but related explanation for the phenomenon observed in this study.

The German study is not the first time the idea of air pressure has been implicated in Mènière's Disease. Externally applied positive pressure therapy has been developed and commercialized for the treatment of Mènière's Disease. Positive pressure therapy works through a device not dissimilar to an aquarium pump, which emits small pulses of pressure through the ear canal and a ventilation tube placed in the tympanic membrane. The belief is that these small pulses of pressure may

MÈNIÈRE'S DISEASE

Ménière's disease is a vestibular disorder that produces a recurring set of symptoms as a result of abnormally large amounts of a fluid called endolymph collecting in the inner ear. The exact cause of Ménière's disease is not known. The four classic symptoms are vertigo, tinnitus, a feeling of fullness or pressure in the ear, and fluctuating hearing.

alter fluid dynamics within the inner ear, resulting in decreased symptoms. The efficacy of this technology has been questioned, however. A recent Cochrane Review of positive pressure therapy in Mènière's Disease found no evidence that it does not produce significant symptom improvement.[2]

ALLERGIES

Another major environmental research theme in Mènière's Disease has explored potential connections with allergic conditions. A report from the renowned House Ear Institute in Los Angeles compared the prevalence of allergic conditions in their patient population with Mènière's Disease to those without Mènière's Disease.[3] In patients with Mènière's Disease, nearly 60% reported possible airborne allergies, 40% suspected food allergies, and 37% had had positive allergy tests. When the prevalence of these allergic conditions was compared to patients without Mènière's Disease, allergic conditions were significantly more prevalent in patients with Mènière's Disease.

A recent review of the evidence connecting allergic conditions and Mènière's Disease suggested that there is credible data to suggest patients with Mènière's Disease may have an enhanced allergic response.[4] While the authors could not conclude that there is a causal association between allergies and Mènière's Disease, they argue that practicing the principles of allergy control is a safe, relatively inexpensive adjunct to typical medical management. It remains to be seen whether the efficacy of this approach produces real benefits for patients with Mènière's Disease.

MIGRAINE

Sensitivity of health conditions and symptoms to weather or climate variation has been well described in qualitative patient symptom surveys.[5] Within the many health conditions surveyed, there is evidence to link migraine disorders and perturbations in weather patterns. Qualitative analyses of patient reported migraine triggers have noted that changes in weather precede migraine attacks second to psychosocial stress.6 Migraine sufferers in northern climates have noted that migraine symptoms seem to occur more frequently in seasons with more daylight.[7] In a group of patients studied from the United States, migraine sufferers reported high humidity, low barometric pressure, and rainy days as having the ability to trigger migraine headaches.[8] There have also been objective reports of weather and climate change on migraine headache symptoms. Periods of meteorological phenomena of warm dry winds, known as the "Chinook Winds" in Canada, have correlated with a greater probability of migraine headache symptoms.[9]

What remains to be characterized is if weather patterns affect vestibular migraine as the pathophysiologic mechanism at play in classic migraine headaches may be shared similar. A common pathophysiologic link would suggest the triggers of migraine headache may also trigger vestibular migraine. However, further work is needed elucidate a role between weather and environmental factors and vestibular migraine.

RESEARCH

One study found evidence that the inner ear can sense changes in barometric (air) pressure: when mice were exposed to lower atmospheric pressure levels similar to those that occur in natural weather changes, certain sensory neurons in the vestibular ganglion—especially those connected to parts of the inner ear like the saccule and posterior semicircular canal—showed significantly increased activity. This suggests that the vestibular system, long known for balance and motion sensing, may also function as a biological barometer, potentially explaining why shifts in weather pressure influence sensations like dizziness or pain in some animals and possibly humans.[10]

CONCLUSION

While further investigation is needed to pinpoint precise mechanisms tying environmental phenomena to Mènière's Disease, curious investigators have produced thought-provoking data to suggest possible associations. The discovery of such associations may open new frontiers for

therapy in the comprehensive management of this often perplexing condition.

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