MENIERE'S DISEASE COLLECTION

Your guide to understanding and coping with Meniere's Disease.

ABOUT MENIERE'S DISEASE

Ménière's disease is a chronic, incurable vestibular (inner ear) 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. It may start with fluctuating hearing loss, eventually progressing to attacks of vertigo and dizziness. No treatment currently exists to cure Ménière's disease. However, medical treatments exist that can help manage it.

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Ménière's Disease

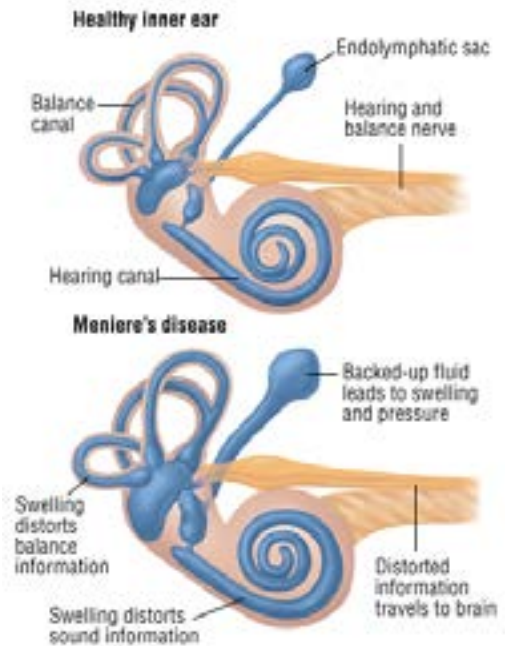
By P.J. Haybach, MS, RN, and the Vestibular Disorders Association, with revisions by Dr. Joel Goebel

ARTICLE 041

In 1861 the French physician Prosper Ménière theorized that attacks of vertigo, ringing in the ear (tinnitus) and hearing loss came from the inner ear rather than from the brain, as was generally believed at the time. Once this idea was accepted, the name of Dr. Prosper Ménière began its long association with this inner ear disease and with inner ear balance disorders in general.

WHAT IS MÉNIÈRE'S DISEASE?

Ménière's disease is a chronic, incurable vestibular (inner ear) disorder defined in 1995 by the Committee on Hearing and Equilibrium of the American Academy of Otolaryngology–Head and Neck Surgery as "the idiopathic syndrome of endolymphatic hydrops." [1] In plain language, this means that Ménière's disease, a form of endolymphatic hydrops, produces a recurring set of symptoms as a result of abnormally large amounts of a fluid called endolymph collecting in the inner ear.



Ménière's disease can develop at any age, but it is more likely to happen to adults between 40 and 60 years of age. The exact number of people with Ménière's disease is difficult to measure accurately because no official reporting system exists. Numbers used by researchers differ from one report to the next and from one country to the next. The National Institutes of Health estimates that about 615,000 people in the U.S. have Ménière's disease and that 45,500 new cases are re-diagnosed each year.[2]

CAUSES

The exact cause and reason why Ménière's disease starts is not yet known. Many theories have been proposed over the years. They include: circulation problems, viral infection, allergies, an autoimmune reaction, migraine, and the possibility of a genetic connection.

Experts aren't sure what generates the symptoms of an acute attack of Ménière's disease. The leading theory is that they result from increased pressure of an abnormally large amount of endolymph in the inner ear and/or from the presence of potassium in an area of the inner ear where it doesn't belong. These conditions may be due to breaks in the membrane separating endolymph from the other inner ear fluid, perilymph. Some people with Ménière's disease find that certain events and situations, sometimes called triggers, can set off attacks. These triggers include stress, overwork, fatigue, emotional distress, additional illnesses, pressure changes, certain foods, and too much salt in the diet.

PROGRESSION OF SYMPTOMS

Common symptoms of a Ménière's disease attack do not reflect the entire picture of the disorder, because symptoms vary before, during, between, and after attacks, and also during the late-stage of Ménière's disease.

Ménière's disease may start with fluctuating hearing loss, eventually progressing to attacks of vertigo and dizziness.

Oncoming attacks are often preceded by an "aura," or the specific set of warning symptoms, listed below.

Paying attention to these warning symptoms can allow a person to move to a safe or more comfortable situation before an attack:

- balance disturbance
- dizziness, lightheadedness
- headache, increased ear pressure
- hearing loss or tinnitus increase
- sound sensitivity
- vague feeling of uneasiness

During an attack of early-stage Ménière's disease, symptoms include:

- spontaneous, violent vertigo

- fluctuating hearing loss
- ear fullness (aural fullness) and/or tinnitus

In addition to the above main symptoms, attacks can also include:

- anxiety, fear
- diarrhea
- blurry vision or eye jerking
- nausea and vomiting
- cold sweat, palpitations or rapid pulse
- trembling

Following the attack, a period of extreme fatigue or exhaustion often occurs, prompting the need for hours of sleep.

The periods between attacks are symptom free for some people and symptomatic for others. Many symptoms have been reported after and between attacks:

- anger, anxiety, fear, worry
- appetite change
- clumsiness
- concentration difficulty, distractibility, tendency to grope for words
- diarrhea
- fatigue, malaise, sleepiness
- headache, heavy head sensation
- lightheadedness (faintness)
- loss of self-confidence and self-reliance
- nausea, queasiness, motion sickness
- neck ache or stiff neck
- palpitations or rapid pulse, cold sweat
- sound distortion and sensitivity
- unsteadiness (sudden falls, staggering or stumbling, difficulty turning or walking in poorly lit areas, tendency to look down or to grope for stable handholds)
- vision difficulties (problems with blurring, bouncing, depth perception, glare intensification, focusing, watching movement; difficulty looking through lenses such as binoculars or cameras)
- vomiting

Duration and frequency of attacks: Attacks can last from 20 minutes to 24 hours. They can occur with the frequency of many attacks each week; or they can be separated by weeks, months, and even years. The unpredictable nature of this disease makes managing it challenging. It also complicates the ability of scientists and physicians to study it.

LATE-STAGE MÉNIÈRE'S DISEASE

Late-stage Ménière's disease refers to a set of symptoms rather than a point in time. Hearing loss is more significant and is less likely to fluctuate. Tinnitus and/or aural fullness may be stronger and more constant. Attacks of vertigo may be replaced by more constant struggles with vision and balance, including difficulty walking in the dark and occasional sudden loss of balance. Sometimes, drop attacks of vestibular origin (Tumarkin's otolithic crisis 3) occur in this stage of Ménière's disease and are characterized by sudden brief loss of posture without loss of consciousness. Some of these late-stage symptoms can become more problematic in conditions of low lighting, or with fatigue, or when a person is exposed to visually stimulating situations.

IS THERE A CURE?

To "cure" a disease means to eliminate the root cause of the disease and reverse the damage it has inflicted (on the inner ear, in this case). No treatment currently exists to cure Ménière's disease. However, medical treatments exist that can help manage it.

TREATMENT

Existing treatments fall into two categories. Some treatments aim at reducing the severity of an attack while it is occurring; some treatments attempt to reduce the severity and number of attacks in the long term. Experts feel these medical treatments provide some degree of improvement in 60–80% of the treated people. [4] Gentamicin is > 80% effective at control of vertigo.

The most conservative long-term treatment for Ménière's disease in the U.S. involves adhering to a **reduced-sodium diet** and using medication that helps control water retention (diuretics or "water pills"). The goal of this treatment is to reduce inner-ear fluid pressure. Some physicians, more commonly outside of the U.S., also weigh the potential efficacy of using betahistine HCl (Serc) as a vestibular suppressant for Ménière's disease. [5]

Medications can be used during an attack to reduce the vertigo, nausea/vomiting or both. Some drugs used for this include diazepam (Valium), lorazepam (Ativan), promethazine (Phenergan), dimen-hydrinate (Dramamine Original Formula), and meclizine hydrochloride (Antivert, Dramamine Less Drowsy Formula).

Vestibular rehabilitation therapy is sometimes used to help with the imbalance that can plague people between attacks. Its goal is to help retrain the ability of the body and brain to process balance information. When successful, this can help a person regain confidence in the ability to move about.

When conservative treatments don't work: For the 20–40% of people who do not respond to medication or diet, a physician may recommend a treatment that involves more physical risk. One such method, **intratympanic gentamicin**, destroys vestibular tissue with injections into the ear of the aminoglycoside antibiotic gentamicin. Recently, intratympanic steroid injections have been used with less risk of hearing loss and persistent imbalance.

Another less conservative treatment method involves **surgery**. Two categories of surgery are available. The goal of the first type is to relieve the pressure on the inner ear. Surgery to reduce pressure is not as widely used now as it was in the past due to questions about its long-term effectiveness.

The goal of the second type of surgery is to block the movement of information from the affected ear to the brain. The process involves either destroying the inner ear so that the ear does not generate balance information to send to the brain, or destroying the vestibular nerve so that balance information is not transmitted to the brain. In either instance, physical therapy is useful to help the brain compensate from the loss of inner ear function due to surgery.

It is difficult to predict how Ménière's disease will affect a person's future. Symptoms can disappear one day and never return. Or they might become so severe that they are disabling.

COPING

Coping with Ménière's disease is challenging because attacks are unpredictable, it is incurable, some of the symptoms are not obvious to others, and most people know virtually nothing about the disorder. Many people with Ménière's disease are thrust into the role of educator—they must teach themselves, their family, friends, coworkers, and sometimes even health care professionals about the disorder and how it impacts them.

Key features of communicating with family and friends include informing them about what might happen with the onset of an acute attack and how they can help. If a low-sodium diet is effective, family and friends should be informed about how important it is for them to support adherence to the diet regimen. Changes in lifelong eating patterns can be easier with the assistance of others.

Managing an acute attack involves preparation. This includes consulting

with a physician about any appropriate drugs that can be taken when an acute attack occurs, and deciding ahead of time when it is appropriate to go to a hospital. During an attack, it is helpful to lie down in a safe place with a firm surface, and avoid any head movement. Sometimes keeping the eyes open and fixed on a stationary object about 18 inches away is helpful. In order to control dehydration, a doctor should be called if fluid intake is not possible over time due to persistent vomiting.

After an acute attack subsides, it is not uncommon to want to sleep for several hours. Resting in bed for a short time is appropriate, if the person is exhausted. But it is also important for the person to get up and move around as soon as possible so that the brain readjusts to the changed balance signals. Precautions need to be taken in this process to accommodate any new balance sensations.

Successfully coping with symptoms involves understanding the disease. Talking with health care providers, communicating with other people who are experiencing the same disease, and reading books and articles about the topic are all helpful methods of learning more about Ménière's disease.

Diagnostic Tests for Vestibular Disorders

By P.J. Haybach, MS, RN, and the Vestibular Disorders Association, with revisions by Dr. Joel Goebel

ARTICLE 026

The inner ear's vestibular organs and the associated nerves and brain centers form a complex system that serves many functions and can be affected by a number of outside systems. A thorough evaluation of the inner ear may therefore require several different kinds of tests. Doctors use information from a person's medical history and findings from a physical examination as a basis for ordering diagnostic tests to assess the vestibular system function and to rule out alternative causes of symptoms. Most people tolerate these tests well. However, sometimes the tests are fatiguing and can result in temporary unsteadiness.

TESTING VESTIBULAR DYSFUNCTION

The vestibular and visual systems are connected to each other and to the muscles in the eyes and neck that help maintain good balance. Head movements or other stimulation of the inner ear sends signals through the nervous system to control eye muscle movements. This forms a reflex pathway called the **vestibulo-ocular reflex, or VOR**. This system is designed to generate eye movements that maintain clear vision when the head is in motion. Many vestibular tests use equipment to monitor the eyes for normal and abnormal movements when the vestibular system is stimulated.

ELECTRO/VIDEO-NYSTAGMOGRAPHY (ENG OR VNG)

Electronystagmography (ENG) refers to a group of tests or test battery, and uses small electrodes placed over the skin around the eyes during testing. ***Videonystagmography (VNG)*** refers to the same test battery run using goggles with video cameras to monitor the eyes. Both the video cameras and the electrodes can measure eye movements to evaluate signs of vestibular

dysfunction or neurological problems. Generally these tests are performed in a room that is dark or with low lighting. The examiner asks random questions that are meant to occupy the person being tested and keep them alert. ENG/ VNG tests are the most common set of tests administered to people with dizziness, vertigo, and/ or imbalance.

VNG BINOCULAR GOGGLES

Parts of the ENG/VNG test battery evaluate the movement of the eyes as they follow different visual targets. Other parts of the ENG/ VNG observe eye movements as the head is placed in different positions. A third component of the ENG/VNG is called the ***caloric test***, which uses changes in temperature within the ear canal to stimulate part of the vestibular system. Air or water may be used to modulate the ear canal temperature, which may be warmer or cooler than body temperature. This test should provoke jerking eye movements (***nystagmus***) for a short time.

CALORIC AIR FX TESTING

ROTATION TESTS

Rotation tests are another way of evaluating how well the eyes and inner ear work together. These tests also use video goggles or electrodes to monitor eye movements. The head is rotated side to side at moderate or slow speeds, and associated eye movements are analyzed. Like the ENG/VNG, rotation tests are performed in a room that is dark with the examiner asking random questions during testing. Rotation tests provide information beyond the ENG/ VNG about how well the balance organs are functioning. Not all people in the diagnosis phase will require rotation tests.

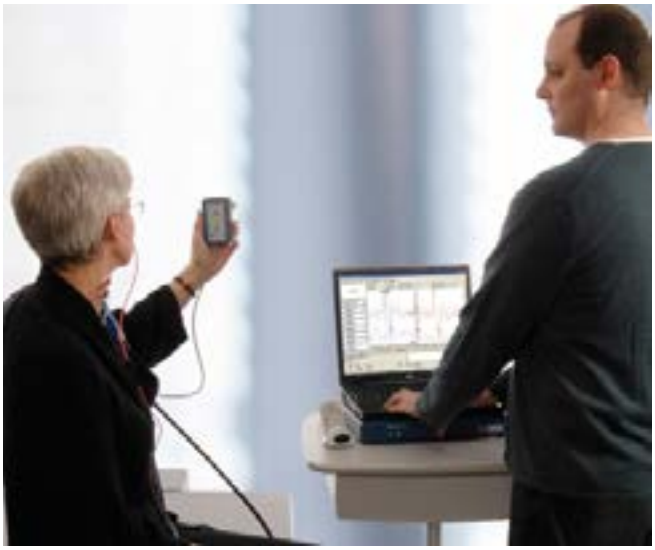
There are different kinds of rotation tests: auto head rotation, computerized rotary chair, or a screening test. In auto head rotation, the person being tested is asked to look at a fixed target and move his/her head back and forth or up and down for short periods of time. During computerized rotary chair tests, the patient sits in a motorized chair that swivels side to side at a controlled rate. Screenings can be performed with the examiner watching the eyes while turning the subject side to side in a swivel chair.

VIDEO HEAD IMPULSE TESTING (VHIT)

VHIT also evaluates how well the eyes and inner ears work together. A small set of glasses with a camera are used to monitor eye movements. The VHIT is similar to rotational testing, where the head is moved to evaluate the vestibulo-ocular reflex. However, the VHIT test uses very small and quick movements of the head to evaluate reflex function, as opposed to the slow or moderate speeds used in rotation testing. Not all people in the diagnosis phase will require VHIT tests.

VESTIBULAR EVOKED MYOGENIC POTENTIAL (VEMP)

VEMP testing is used to evaluate whether certain vestibular organs and associated nerves are intact and functioning normally. Responses in this test are measured from different muscles in the neck and around the eyes. VEMP testing uses adhesive, skin surface electrodes (like ENG or some rotational tests) and earphones (like those used during a hearing test). Sound is played for a few seconds through the earphones, the vestibular organs are stimulated and activate muscle responses, and electrodes record the results.



VEMP TESTING

COMPUTERIZED DYNAMIC POSTUROGRAPHY (CDP)

CDP tests postural stability or the ability to maintain upright posture in different environmental conditions. Maintenance of postural stability depends on sensory information from: the body's muscles/joints, eyes, and inner ears. This testing investigates relationships among these three sensory systems and records the balance and posture adjustments made when different challenges are presented. This test may also be used in a rehabilitative setting after a diagnosis has been determined, and is not performed on all people in the diagnosis phase.

CDP tests involve standing still on a platform. The platform may be still or able to shift, or a visual target may be still or able to move during testing. Pressure gauges under the platform record shifts in body weight (body sway) as the person being tested maintains balance under different conditions. A safety harness is worn as a precaution, should the patient lose their balance.

AUDIOMETRY (HEARING TESTS)

Audiometry measures hearing function. Hearing evaluations are an important part of vestibular diagnostics, because the inner ear contains both hearing and balance organs. More than one hearing test may be required when a person has a vestibular disorder, especially when there is evidence of hearing loss, a sensation of fullness in the ears, or tinnitus (ringing or noise in the ears).

The audiometric test battery is carried out in a sound-treated room. Earphones are used to present words and tones at different pitches and levels. A response is requested when these sounds are heard. Testing with words may include repeating words in a quiet room or when noise is playing.

Another part of a standard hearing test is tympanometry, which can help detect problems between the ear drum and the inner ear. Tympanometry uses a small earpiece that creates pressure and plays sound in the ear canal to gather information. The same equipment can also be used for acoustic-reflex testing, which measures the reflex of muscles in the middle ear in response to pressure and loud sound.

OTOACOUSTIC EMISSIONS (OAE)

OAE testing provides information about how the hair cells of the cochlea are working by measuring the responsiveness of hair cells to a series of clicks produced by a tiny speaker inserted into the ear canal. Most often this test is used to evaluate hearing for people who are unable to respond to a traditional hearing test (such as infants).

ELECTROCOCHLEOGRAPHY (ECOG)

ECoG measures a response to sound from the nervous system. It utilizes an earphone and electrodes while the person being tested lays still in a comfortable position. Not all people in the diagnosis phase will need ECoG tests.

An earphone plays sound in the ear and an electrode measures a response. Different electrodes can be used in this test. Some may be adhesive, skin-surface electrodes. Others may fit in the ear canal like an earphone, while a third type of electrode is designed to gently rest against or touch the eardrum. A fourth type of electrode is a needle that is placed through the eardrum to touch the inner ear. Most clinics use the first three types of electrodes to measure an electrical signal while sound is playing.

AUDITORY BRAINSTEM RESPONSE TEST (ABR; OR BER, BSER, OR BAER)

The ABR measures how the nervous system responds to sound. The test setup and procedure is similar to the ECoG. Most often ABR is used to test hearing for people who are unable to respond for audiometry (such as

infants). Occasionally this test is used when someone cannot have imaging performed (such as people with a metal plate in the body/brain).
Under certain circumstances, this test can indicate the presence of an acoustic neuroma (a rare, benign tumor of the vestibulo-cochlear nerve). It may also help identify conditions such as multiple sclerosis if they have affected the auditory pathway to the brain.

MAGNETIC RESONANCE IMAGING (MRI)

MRI uses a magnetic field and radio waves to produce cross-sectional images of body tissues being scanned. An MRI of the brain can reveal the presence of tumors, stroke damage, and other soft-tissue abnormalities that might cause dizziness or vertigo. MRIs of structures in and around the inner ear can be helpful in the diagnosis of some vestibular disorders.

COMPUTERIZED AXIAL TOMOGRAPHY (CAT, OR CT)

A CT scan is an X-ray technique that is best for studying bony structures. The inner ear is inside of the skull's temporal bone on each side. These scans are often used to look for abnormalities around the inner ear, such as fractures or areas with thinning bone.

OTHER TESTS

Depending on your circumstances, other tests may be necessary to discover the cause of a balance disorder. Blood work, allergy tests, vision tests, and other exams may help rule out causes of imbalance that are unrelated to the vestibular system.

WHO PERFORMS VESTIBULAR TESTING?

Generally your primary care physician, ENT or neurologist will refer you to: an audiologist for hearing or balance related testing, a physical therapist for gait or balance related testing, or a radiologist for imaging testing. These specialists will send your test results back to your physician with an analysis, and your physician will explain them to you.

Dietary Considerations

By Vestibular Disorders Association (VeDA) with updates by
Jessica Lieffers, PhD, RD

Many people with Ménière's disease (also called primary idiopathic endolymphatic hydrops), secondary endolymphatic hydrops, or vestibular migraine find that certain diet modifications help manage their condition. However, others with these vestibular disorders may find diet modifications are not helpful. Each person is different, so you will need to discover what works best for you. Peer-reviewed research on diet and vestibular disorders is very limited. Therefore, more studies are needed before definitive conclusions can be made on relations between diet and vestibular disorders. Further research is also needed to develop more specific dietary recommendations for people with vestibular disorders.

Even if food does not trigger your symptoms, it is important for everyone with vestibular disorders to follow a healthy diet for overall health and well-being. Following a healthy diet also helps reduce the risk of other chronic diseases like heart disease, type 2 diabetes, hypertension and improves overall well-being. Following national nutrition recommendations, such as the Dietary Guidelines for Americans or Canada's Food Guide, is a good starting point. National nutrition guidelines usually recommend eating a variety of foods from all food groups and choosing options low in sodium, added sugars, and saturated fats. Other healthy dietary patterns that may be helpful for people with vestibular disorders to follow are the Mediterranean diet, the Dietary Approaches to Stop Hypertension (DASH) diet, and the Mediterranean-DASH Diet Intervention for Neurodegenerative Delay (MIND) diet. Additionally, limiting alcohol and caffeine intake may help decrease vestibular symptoms for some people.

Some people with vestibular disorders are also interested in trying elimination diets. An elimination diet consists of two phases: the elimination phase

GENERAL GUIDELINES

1. Distribute food and fluid intake evenly throughout the day and from day to day. This includes consuming approximately the same amount of food at each meal, not skipping meals, and eating snacks, if needed, at regular intervals. Evenly spacing food and fluid intake helps with inner-ear fluid stability; hypoglycemia (low blood sugar) can trigger migraine attacks. Having breakfast soon after rising can help stabilize your system for the day.
2. Avoid foods and beverages that have a high salt or sugar content. In general, a diet high in fresh fruits, vegetables, and whole grains and low in canned, processed frozen food, and other processed foods helps control salt and sugar intake. Be careful of drinking fruit juices as they may have a very high sugar content.
3. Drink adequate amounts of fluid daily. Fluids can include water, milk, and low-sugar fruit juices but not coffee, caffeinated tea, alcohol, or soft drinks. If possible, extra fluids should be drunk before and during exercise and in hot weather. It is important to make sure that you drink at least 5 or more glasses of water over the course of the day. You should not have all your fluid intake a one time.
4. Avoid foods and beverages with caffeine.
5. Limit or eliminate alcohol consumption.
6. Do not use tobacco.
7. Check with your Physician or a Natural Health Practitioner before taking extra herbs, vitamins and supplements.

(all foods suspected of being possible triggers are eliminated in an attempt to relieve symptoms) and the re-introduction phase (careful re-introduction of foods once symptoms are resolved). Elimination diets should only be done under the supervision of a physician and/or a registered dietitian to avoid nutrient deficiencies, ensure appropriate energy (calorie) intake, and prevent eating disorders. Following elimination diets for long periods of time could make your vestibular symptoms worse. The Academy of Nutrition and Dietetics also recommends that elimination diets should only be followed for a short period of time (4-8 weeks).

If you have any questions or concerns about dietary strategies, including supplement use, for managing a vestibular disorder, please consult your physician or a registered dietitian. They can help you develop a personalized plan tailored to your unique needs (including both your vestibular disorder and any other health concerns) to ensure that you are meeting all nutritional requirements. They can also work with you to help you identify whether foods impact your vestibular symptoms. Please also consult a licensed healthcare provider (e.g., physician, registered dietitian, pharmacist) before taking any additional herbs, vitamins, or supplements. These products could worsen your vestibular symptoms or interact with your medications.

INNER EAR FLUID BALANCE

In people with Ménière's disease and secondary endolymphatic hydrops, fluid (endolymph) is thought to build up in the inner ear which can cause numerous symptoms (e.g., pressure or fullness in the ears, tinnitus (ringing in the ears), hearing loss, dizziness, vertigo, and imbalance). Diet, and specifically sodium (salt) intake, is thought to be one factor that affects inner ear fluid (endolymph) levels in people with Ménière's disease and secondary endolymphatic hydrops. More specifically, large amounts of salt in the diet can affect the blood electrolyte concentration which is thought to be a factor that can impact the inner ear fluid (endolymph). In fact, the clinical practice guideline for Ménière's disease published in 2020 list diet changes as the 'least aggressive' treatment for this disease. These guidelines also recommend that clinicians educate people with Ménière's Disease on diet changes for disease management.

DIETARY GOALS

Although diet changes may not be helpful for everyone with Ménière's Disease, they are an important strategy to try to obtain symptom relief. As well, many of the strategies below that are listed for Ménière's Disease are general principles for healthy eating which may be helpful for individuals to follow when living with other vestibular disorders.

Limiting dietary salt/sodium
Sodium intake is recommended to be limited for people with Ménière's disease because it is thought to increase inner ear fluid (endolymph) levels. Although sodium reduction has long been thought to be beneficial for the management of Ménière's disease, a recent Cochrane Review found no randomized controlled trials exist on this topic. More research in this area is still needed.

Because of the lack of research and guidelines on low sodium diets for people with Ménière's disease, the clinical practice guidelines for Ménière's disease published in 2020 lists the American Heart Association recommendations for a low sodium diet.

The American Heart Association recommendations suggest the ideal amount of sodium to consume each day is 1500mg. They also recommend no more than 2300mg of sodium each day. Most people in North America consume an average of

DIETARY CONSIDERATIONS

- Sodium
- Sugar
- Caffeine
- Suppliements
- Alcohol
- Specific Migraine Triggers
- Medications
- Nicotine

3400mg of sodium per day which is above the maximum recommendation suggested by the American Heart Association. Following the American Heart Association guidelines for sodium may also be helpful to prevent high blood pressure.
Before trying a low sodium diet, it is always best to ask your physician about what amount of sodium is ideal for your unique situation.

Difference between salt and sodium
Salt and sodium are not identical; table salt (sodium chloride) is made up of 40% sodium and 60% chloride. 1 tsp of table salt is equal to about 2300mg of sodium. Sea salt, Kosher salt, pickling salt, Himalayan salt, and rock salt all have the same amount of sodium as table salt.

Salt in the foods we eat
Salt is everywhere in the foods we eat. Salt has numerous roles in foods which is perhaps why is it so prevalent in our food supply. Some roles of salt in our food include a flavor and texture enhancer, preservative, binder, color aid, and for fermentation control. According to the American Heart Association, about 15% of the sodium we eat occurs naturally in foods and beverages, about 11% of sodium is added while cooking or eating (e.g., using a salt shaker at the table), and 70% of sodium we eat comes from the processed foods and foods eaten at restaurants. Salt is commonly added to processed foods to increase shelf life and palatability.

Foods that are naturally low in sodium include water, fresh fruits and vegetables, unprocessed grains, and most fresh meats, poultry, and fish. Some frozen or canned food items (e.g., vegetables, beans) are available without added salt.

Foods that contain large amounts of sodium include many convenience foods, such as frozen meals, items from restaurant take-out menus, and foods with monosodium glutamate (MSG).
As well, processed meats such as ham, hot dogs, and bacon, many canned meats and vegetables, seasoning mixes, pickles, pickled banana peppers, commercial salsa, olives and condiments such as soy sauce, teriyaki sauce, ketchup, barbecue sauce, mustard, are also high in sodium. Canned and dehydrated soup, cereal, vegetable juices, cheese, salad dressings, sauces (e.g., tomato sauce), chips, commercial baked goods (e.g., crackers, bread, pretzels, tortillas), and salted nuts may also be important contributors of sodium in our diets.

Strategies for Reducing Sodium Intake
Many strategies can be used to help decrease dietary sodium intakes which are listed below. Of note, some people find that it is difficult to adapt to a reduced-sodium diet because salt is so often used to make foods taste better. One strategy is to reduce salt gradually if you are having difficulties adjusting to the change. A registered dietitian can also provide you with personalized strategies to decrease your sodium intake.

Reading Labels for Sodium Content: Reading labels, especially on packaged, canned and jarred foods, is important for people limiting sodium in their diets. This strategy is important because some foods that are high in sodium do not taste salty.

Ingredient lists with the words 'sodium,' 'soda,' 'brine,' 'baking powder,' 'soy sauce,' and/or 'salt' indicate the presence of sodium. It is important to compare various brands and products to find those with the least sodium, as there can be a large variation. When comparing brands, keep in mind that serving sizes on packages and containers for similar products can vary and may not represent the amount you eat. Keep in mind too that eating large amounts of foods with smaller amounts of sodium can also add up to a large amount of sodium in your overall day.

To make label reading easier, the FDA (US Food and Drug Administration) has established definitions for salt/sodium content in food labeling to help consumers identify reduced sodium foods. The definitions are as follows:

- **Sodium/salt-free**: Less than 5 mg of sodium per serving
- **Very low sodium**: 35 mg of sodium or less per serving
- **Low sodium**: 140 mg of sodium or less per serving
- **Light in sodium or lightly salte**d: At least 50% less sodium than the regular product
- **Reduced sodium**: At least 25% less sodium than the regular product
- **No-Salt-Added or Unsalted**: No salt is added during processing, but these products may not be salt/sodium-free unless stated

Another strategy when reading labels for sodium content is to use the % Daily Value (% DV). Foods with a 5% DV or less/serving are generally considered a low source of sodium, while foods with a 20% DV or higher/serving are generally considered a high source of sodium.

Strategies for Reducing Sodium Intake at Home: When cooking at home, it's important to be selective about ingredients, including seasonings, and to look for hidden sources of sodium in packaged, canned and jarred foods. For those accustomed to using salt in cooking and at the table, foods may initially taste bland when you reduce the sodium content. However, introducing

herbs and spices can enhance flavor and make meals more palatable.

Strategies to reduce sodium intake at home

- Rinsing canned vegetables and beans to reduce sodium.
- Cooking foods without adding salt, such as not adding salt to pasta water.
- Using spices and herbs to flavor your food.

If you find it difficult to adjust to a reduced-sodium diet, you can decrease salt gradually in cooking and/or at the table.

Commercial salt substitutes may be an option for some people to reduce salt intake. These substitutes sometimes contain mixtures of herbs and spices. However, some salt substitutes can taste bitter and often include potassium, which can complicate certain medical conditions, particularly those involving the kidneys. Therefore, these products should not be used without first consulting a physician.

Strategies for Reducing Sodium Intake When Dining Out

In restaurants, batter-fried foods tend to be salty, as are combination dishes such as soups or pasta with sauce. To reduce sodium intake, consider:

- Selecting plain foods from the menu, such as grilled or roasted entrees, baked potatoes, and salads dressed with oil and vinegar.
- Requesting gravies, sauces, and salad dressings to be served on the side or for dishes to be prepared without added salt.
- Substituting a side salad or fresh fruit in place of fries or other salty items.
- Asking for no salt to be added when cooking vegetable side dishes.

Be cautious of words like "smoked" or "blackened," as these foods are generally high in sodium. Many large chain restaurants provide their nutrition information online; checking this information before your visit can help you make better choices.

MEDICATIONS

Antacids and other medications sometimes contain sodium. A pharmacist can provide information and guidance regarding the sodium content of medications.

The 2020 clinical practice guidelines on Ménière's Disease also list other dietary recommendations that may help people manage this condition. These recommendations include:

LIMIT CAFFEINE AND ALCOHOL INTAKE

Although there are no randomized controlled trials on the impact of caffeine and alcohol on Ménière's Disease, they are thought to cause blood vessel constriction, which can lower blood flow to the inner ear and potentially

increase symptoms. The diuretic properties of caffeine also cause excessive loss of body fluids. Foods and beverages that often contain caffeine include coffee, some soft drinks (e.g., cola), energy drinks, chocolate, and caffeinated teas (e.g., black tea, green tea).

EAT WELL-BALANCED MEALS THROUGHOUT THE DAY

Balanced meals should contain vegetables and/or fruit, whole grains, and protein foods. An easy way to think about balanced meals is to have 1/2 of your plate as vegetables and/or fruit, 1/4 of your plate as grain products (half of the grain products in a day should be whole grain), and 1/4 of your plate as a protein food (e.g., meat, fish, eggs, nuts, seeds, tofu). About the same amount of food should be eaten at each meal. Additionally, it is important to have breakfast soon after rising and avoid skipping meals. Snacks, if needed, should also be consumed at regular times each day.

HYDRATE

Drink plenty of water throughout the day and avoid high-sugar beverages. High sugar beverages include soft drinks, fruit juices, including 100% fruit juice, fruit drinks, sports drinks, energy drinks, lemonade and sugar sweetened coffee and tea drinks. Extra fluids should be consumed before and during exercise and in hot weather. Water intake should be spaced out throughout the day and not consumed all at once.

IDENTIFY AND MANAGE ANY ALLERGIES

People with Ménière's disease are more likely to report allergies compared to the general population. The 2020 Ménière's disease clinical practice guidelines mention that some studies have found relationships between this disease and allergies although research is limited. Controlling allergies (including food allergies) has been suggested to be a strategy that may help to manage this disease in some individuals.

KEEP A DIARY OR JOURNAL OF FOOD TRIGGERS

Some individuals may have one food trigger for their vestibular symptoms, some may have many food triggers, and others may have none. Keeping a diary or journal may help you identify triggers for your unique situation.

SUGAR

In addition to the recommendations in the 2020 clinical practice guidelines on Ménière's Disease, some health providers recommend limiting meals or

snacks with high sugar content, as this may increase vestibular symptoms in some people.

Limiting added sugars is also recommended for overall health. The most recent version of the Dietary Guidelines for Americans recommends that all individuals aged 2 years or older consume no more than 10% of their calories as added sugars (approximately 12 teaspoons of sugar on a 2000kcal/day diet). Many people eat too many added sugars; the average adult in the United States consumes 17 teaspoons of sugar each day. Too many added sugars can also increase your risk of obesity, heart disease, and diabetes.

Added sugars include those sugars added at the table or during cooking, and those added to foods during manufacturing. Added sugars also include those found in honey and syrups, and sugars from concentrated vegetable or fruit juices. Added sugars do not include sugars naturally found in fruits, vegetables and milk.

Sugars are added to foods for numerous reasons including palatability, texture, crystallization, browning, caramelization, moisture absorption, fermentation, leavening, and preservation.

Foods high in added sugars include candy, cakes, pastries, cookies, and sugar-sweetened beverages such as regular soda, sports drinks, energy drinks, and fruit drinks. These foods are also often high in calories and low in nutrients needed for good health. Fruit juices (including 100% fruit juices) are also very high in sugars and should be limited. Added sugars can also appear in various other foods including pasta sauce, BBQ sauce, salad dressings, ketchup, some peanut butters, some breakfast cereals, some flavored yogurts and some granola/granola bars.

Tips for lowering overall added sugar consumption include cutting the amount of sugar in recipes in half, substituting fresh fruit for sweetened baked goods, using fresh fruit or berries to sweeten dishes, reading labels, and possibly using sugar substitutes.

Reading labels for added sugar content

On packaged-food labels, ingredients that end in "ose" are added sugars (e.g., dextrose, glucose, fructose, and sucrose). High-fructose corn syrup, honey, malt syrup, maple syrup, agave, and molasses are also sugars. If one of the first three ingredients listed on the label is a sugar, the sugar content of that product will likely be high, but it is always good to check the actual added sugar amount (listed in grams) on the label.

Sugar substitutes:
Sugar substitutes can be classified into three categories:
artificial sweeteners, sugar alcohols, and plant and fruit-based sweeteners. Foods and beverages with words such as "diet" or "keto" often contain sugar substitutes. Sugar substitutes do not provide any essential nutrients, and it is important to ensure that foods containing these components do not replace nutritious foods. In general, it is best to limit consumption of sugar substitutes by staying under the acceptable daily intake (ADI) level. The ADI is "is the amount of a substance considered safe to consume each day over the course of a person's lifetime." As well, foods containing sugar substitutes may not be a nutritious choice.

Currently, very limited research is available on sugar substitutes and vestibular disorders, but for some people, some sugar substitutes could worsen symptoms. A physician or registered dietitian can provide personalized advice about whether sugar substitutes are appropriate for you.

Artificial Sweeteners Several artificial sweeteners, including saccharin (Sweet'N Low), aspartame (Equal, Nutrasweet), acesulfame potassium (Ace K), neotame, advantame, and sucralose (Splenda), have been approved by the FDA. Artificial sweeteners do not contain any calories, but their chemical composition may include sodium (e.g., sodium saccharide). Some artificial sweeteners are not always suitable for use in cooking or baking. Individuals with phenylketonuria (PKU) should avoid foods containing aspartame. Aspartame may also trigger vestibular symptoms (e.g., vestibular migraine) in some people.

Sugar Alcohols Sugar alcohols (e.g., sorbitol, xylitol, lactitol, maltitol, erythritol) are lower in calories compared to sugar and are sometimes used in highly processed foods (e.g., candies, chocolates, frozen dessert bars). For some people, sugar alcohols can cause gastrointestinal discomfort (e.g., bloating, diarrhea, gas).

Plant and Fruit-Based Sweeteners Plant and fruit-based sweeteners (e.g., Stevia, Monk fruit) are newer sweeteners that are appearing on the market.
Vestibular Migraines

For people with vestibular migraines, foods and drinks consumed can be both a trigger and can provide symptom relief. Like other vestibular disorders, more research is needed on the relationship between diet and vestibular migraine before more definitive recommendations can be made.
In general, vestibular migraine has numerous triggers, including stress, hormones (e.g., menstrual cycle), sleep, weather, lighting, dehydration, fasting/meal skipping, and foods and drinks consumed. It is important to note that migraine triggers can interact with each other and can vary both between individuals and within the same person. For example, in an individual, a specific factor might trigger a migraine one day but not in another day, due to the presence or absence of other migraine triggers. This complexity makes understanding and studying migraine triggers challenging. A diary can be a helpful strategy for some people to identify potential triggers (including

food triggers).

For some people, foods and drinks consumed can be a trigger for vestibular migraine. Avoiding food triggers may help control vestibular migraines for some people. Each person with migraines will also have different food triggers; you will need to determine if foods trigger your symptoms, and if so, which ones. You will also need to determine the amount of the food that may trigger your symptoms. Additionally, certain foods might trigger a migraine on one day but not another depending on your situation on a specific day (e.g., exposure to other food and non-food migraine triggers). Identifying individual food triggers for vestibular migraine may require some detective work.

Several different foods and drinks are thought to be possible migraine triggers. Some of these foods are high in tyramine which is formed from the breakdown of tyrosine, an amino acid. Not all people with migraines are affected by these triggers. You could have one food trigger, several food triggers, or no food triggers. Some examples of food-related migraine triggers are listed below.

- Alcohol
- Caffeinated drinks: Tea, coffee, cola, energy drinks
- Some dairy products: Ripened cheeses (such as cheddar, Stilton, Brie, and Camembert), sour cream, yogurt, buttermilk
- Some fruits: Figs, avocados, raisins, red plums, passion fruit, papaya, bananas, and citrus fruit
- Some vegetables: Pea pods and pods of broad beans (e.g., lima and navy beans), onions
- Some meat and poultry products: Processed meats (e.g., bacon, sausage, ham, salami, pepperoni, bologna, hot dogs), chicken livers, smoked meats
- Nuts and peanut butter
- Fermented and pickled foods: olives, pickles, other pickled vegetables, pickled herring
- Foods made with meat tenderizer, soy sauce, vinegar (except white vinegar), or yeast extract
- Fresh bread and baked goods containing yeast
- Chocolate, cocoa, carob
- Aspartame
- Foods containing monosodium glutamate (MSG)
- Fasting, irregular eating patterns

Elimination diets (as described above) may be another strategy to help identify potential migraine triggers. As mentioned previously, these diets should only be done under the supervision of a physician and/or registered dietitian and are not meant to be followed long term (i.e., more than 4-8 weeks).
Various types of diets, such as the Dietary Approaches to Stop Hypertension (DASH), Mediterranean diet, and low glycemic index diets, diets high in omega-3 fatty acids could be beneficial for people with migraines to follow.

However, studies are limited, and more research is needed before specific recommendations can be made.

It is essential to consult a physician or registered dietitian before making any dietary changes for managing vestibular migraine. These healthcare professionals can help determine what is best for your unique situation, considering your vestibular disorder and other health conditions. They will also ensure that any special diets are followed properly to maintain appropriate energy intake, avoid nutrient deficiencies, and manage any potential side effects.

Hearing Aids

By: Eric Bostwick, AuD

ARTICLE 116

HOW DID WE GET HERE? WHAT CAUSES HEARING LOSS IN THE FIRST PLACE?

Hearing loss can be caused by a variety of risk factors. These most commonly include natural aging (degeneration of inner ear structures over time), exposure to loud sounds which includes both recreational (activities such firearm usage and motorcycling) and occupational noise (some job types such as construction, farming, etc.), head trauma, genetics, medications, and many types of viruses and illnesses.[18] There are three types of hearing loss. The first of these is called conductive hearing loss, wherein sound doesn't properly reach the hearing organ in the inner ear called the cochlea. The second type of hearing loss is called sensorineural hearing loss, which is damage to the inner ear system itself. The third type of hearing loss is mixed hearing loss, which is simply a combination of both conductive and sensorineural hearing loss. Whereas conductive hearing losses can often be treated by a medical professional, most types of sensorineural hearing loss are permanent. To date, the primary treatment for chronic hearing loss is hearing aids.

THE CONNECTION BETWEEN HEARING AND BALANCE

The triad of equilibrium maintenance classically includes successful integration of the visual, proprioceptive/somatosensory, and vestibular inputs.[40] The central nervous system takes all this information together and is suspected to weigh the dependence of which system it's relying on based on changes in our sensory input. As an illustration, imagine yourself simply standing still. In the maintenance of stance alone, the ability to remain upright and steady on a flat surface is largely dependent on information gathered from our proprioceptive and somatosensory inputs. The feeling of our feet on the ground, awareness of our steadiness, our understanding of our feet stacked beneath our hips, stacked beneath our shoulders, all comes from this system. If we were to remove this information from the brain, we would start to see that person's stance become less quiet, and they will start to sway as they struggle to use the other inputs–vestibular and vision, to compensate for

THE IMPACT OF HEARING LOSS AND WHY WE NEED A SOLUTION

Hearing loss is increasingly becoming one of the most prevalent chronic health conditions worldwide. According to a recent Global Burden of Disease Study, hearing loss is the third leading cause of "years lived with a disability," and affects individuals at all ages across the lifespan.[44] Though estimates vary, approximately 1.5 to 3 per 1,000 babies are born in the US with a hearing loss,[13] and nearly 15% of American children aged 6-19 are reported have some degree of hearing loss.31 These numbers continue to grow with age over time. The National Institute on Deafness and Other Communication Disorders (NIDCD) estimates that hearing loss affects approximately 37.5 million adults in America.[1] When considering what this means for our national productivity, the implications are staggering.

Many of us have probably had a family member, friend, or colleague with hearing impairment that reported some difficulty in social settings, in school, or the workplace. Whether the difficulty is over the phone or in person, hearing loss can impact our ability to communicate successfully. Children with hearing loss are at risk for developing speech and language delays. Students with hearing loss typically perform less well than those with normal hearing in a traditional school setting, and this performance gap can increase over time. In some cases, students that don't receive additional services have fallen behind up to four grade levels.[6] For working adults, according to an income study by Kochkin in 2010,[23] untreated hearing loss is estimated to cause $176 billion in lost potential earnings. Though the Americans with Disabilities Act (ADA) requires that businesses make reasonable accommodations for individuals with hearing loss, there was a reported difference of $14,100 between those with mild and those with severe hearing loss. Depending on the type of job, hearing aids were estimated to mitigate the impact of income loss by 90-100% for mild hearing loss and 65-77% for moderate to severe hearing loss.[23] We know from several studies over the years that hearing loss affects more than just our ability to function at school and in the workplace, but has direct implications for our overall quality of life.

Untreated hearing loss has been linked to an increased risk for a variety of other medical problems. Some of these include social withdrawal,[28] loneliness,[46] depression,[35] anxiety,[4] increased hospitalization,[10] poor adherence to medical treatments,[27] falls,[20] and cardiovascular disease.[45] Hearing loss has also been strongly linked to tinnitus, or ringing in the ears.[42] Our understanding of the human body as a remarkable set of interconnected systems is continuing to develop. The brain puts together information from multiple sensory modalities to give rise to our awareness of our environment. The advancement of hearing loss may be an indicator that signals progression of other chronic health problems. Recently there's been a wealth of studies that have looked at hearing as an important component of balance.

this lack of information.[5] In the example above, it's relatively easy to separate these three inputs apart, but in a more dynamic situation, say jumping and turning around to catch a frisbee on sand while being mindful not to step near a patch of rocks, our brain has a much more difficult task and needs each of these systems to work harmoniously to allow us to coordinate our muscles effectively. The successful integration of these elements is critical for safety in the real world and allow us to interact seamlessly in our environment, but what if there is more to the equation? Is there anything else that we can use to supplement this information, especially when one part isn't working properly, say in the case of acute vestibular neuritis?

TRIAD OF EQUILIBRIUM MAINTENANCE	
Visual	What you see in your surroundings
Proprioceptive/Somatosensory	The feeling of your feet on the ground
Vestibular	Your sense of balance

Some researchers are proposing that this model should also include hearing, and that our brain may be able to use auditory cues depending on the sensory demands of the task. The hearing and vestibular organs have a lot in common from an anatomical and physiological standpoint.[29] The two systems both send information to the temporal lobe of the brain via cranial nerve VIII. Both take advantage of mechanical receptors called hair cells to change the physical signal of head acceleration (in the vestibular system) and sound (in the cochlea) into an electrochemical signal. There are also several vestibular disorders that impact both hearing and balance. So the question we are now asking is whether hearing plays more of a role in balance as well than previously credited?

We know that the auditory system can help provide us with a representation of three-dimensional space surrounding us.[40] Having an external sound source in the room such as a radio playing music, gives our brain an external reference point to focus on. Auditory cues subconsciously influence our postural alignment, and our posture automatically impacts our ability to localize cues in our environment. Our ability to tell where sounds are coming from helps us remain comfortable with our surroundings, and in many cases, is critical for safety. Being able to tell who's talking in a group setting will cue you into who to pay attention to at your lunch meeting, but being able to effectively localize, for example, a car horn in traffic, can be the difference between

an accident and moving to safety. Our auditory system uses both the central nervous system and binaural hearing, or the interplay of both ears working together, to analyze our auditory scene around us. To accomplish this, we take advantage of interaural time differences (whether sound first reaches the right vs. left side) interaural level differences (subtle changes in the intensity of sound as it projects across the head in space), and spectral shape cues (differences in acoustic energy) as they travel into our ear canals that are acoustically optimized for sound.[7] It is possible that these spectral cues give rise to a spatial reference, allowing us to determine the angle and distance relative to an external sound.[49]

Though the evidence is still emergent, encouraging studies have shown a relationship between auditory cues and static balance,[40] balance during movement,[49] how we orient and stabilize,[8] and depth assessment.[11] Moreover, in some patients with vestibular deficit, it was found that auditory biofeedback can partially compensate for the affected vestibular system.[5] These findings suggest that optimizing spatial auditory cues may be a different approach to enhancing postural stability and ultimately, reducing fall risk. Several population studies have shown that hearing loss is associated with falling, and in a recent study Shayman et al. (2020) have suggested that the use of amplification (i.e. hearing aids) might be an alternative approach for physical therapy programs and auditory rehabilitation techniques to improve balance in individuals with hearing loss.[37]

BEYOND THE EAR—HEARING AND THE BRAIN

The human brain possesses an incredible capacity for neuroplasticity, the ability to reorganize connections between nerve cells, over our lifespan. This ability allows us to adapt to change during development and adulthood ranging from insult and injury to learning and experience. Recent research using imaging has demonstrated that in cases of sensory deprivation our brain can engage in a process called "crossmodal plasticity." When this process occurs, cortical regions of the brain that are "unused" are repurposed and taken over by remaining sensory modalities. Studies have established that this occurs in individuals with congenital deafness where crossmodal plasticity favors the visual and somatosensory systems. This could be the result of increased reliance on visual cues to help in noisy environments. Recent literature, however, has found this effect to occur in individuals with mild to moderate hearing loss, including sensorineural hearing loss as a result of aging (see Glick & Sharma (2017) for a review on these above topics).[11] This is significant because many individuals who would benefit from hearing aids as demonstrated on an audiogram end up deferring treatment. One

recent study showed that many potential hearing aid candidates wait an average of 8.9 years from the time of their initial diagnosis to being fit with their first pair of hearing aids.[38] While these individuals are delaying treatment, all the meanwhile their brain is slowly changing in response to the reduction of stimulation to the auditory cortex. Based on these findings, by the time of hearing aid treatment a candidate's auditory brain at a functional level can be very different from what they experienced when that person experienced no hearing problems.

Anecdotally, the longer a hearing loss is left untreated, the harder the rehabilitation process is generally with hearing aids. Individuals who have untreated hearing loss for many years may have poorer outcomes when they decide to finally pursue hearing aids. These crossmodal changes in the central nervous system might offer a visual explanation of why speech understanding in individuals with longstanding hearing loss is limited even with optimally fit hearing aids. Speech understanding is also exacerbated by competing background noise or other distracting stimuli-the brain has to do extra work to try to make sense of the incoming auditory signal. This has been demonstrated in research that measures pupillometry, or measurement of pupil dilation to difficult auditory stimuli.[47-48] Hearing loss is now being shown to have direct effects on how our brain functions.

Several recent studies have described an association between hearing loss, cognitive decline, and dementia.[9, 14, 24, 26, 41] Hearing loss prevention has been deemed the largest modifiable risk factor for development of dementia, ranking above other common risk factors such as smoking, high blood pressure, lack of exercise, and social isolation.[19] It is estimated that hearing loss accounts for up to 9.1% of the modifiable risk for dementia.[25] A recent longitudinal study by Sarant et al. (2020) found that hearing aid performance resulted in significantly improved cognition for participants 18 months following hearing aid usage.[36] Though results are still preliminary in establishing a direct causal link, results are encouraging and may suggest that in order to preserve our brain, we may need to more strongly consider preserving our hearing. In light of the abundance of research suggesting the beneficial usage of hearing aids, one pattern that needs addressing is why those who could benefit from hearing aids elect often not to.

HEARING AID ACCEPTANCE—AN ELEPHANT IN THE ROOM

Hearing loss for most individuals is a marathon—not a sprint, and hearing aids aren't a "one-time fix." It can be a lifelong journey that requires consistent reinvestment in one's health. For hearing aids to work properly, they require both routine maintenance and follow-up care. Despite the documented benefits, discussing hearing aids for many individuals with hearing loss can be a frustrating topic. In the United States, it is estimated that upwards of 28.8 million adults could benefit from hearing aids.[30] According to one survey of American adults, only about 30% of those with hearing aid difficulties pursue treatment.[15] Reasons behind poor acceptance and tolerance of hearing aids can vary for each person, but one of these reasons is often the high cost of

amplification .[2, 15, 21, 22, 32] Though some financial assistance programs are available and some insurance policies are now starting to include hearing aid benefits, today's modern hearing aids can end up costing patients several thousand dollars out of pocket. Other often cited reasons for deferring treatment include: difficulty with care and maintenance, discomfort while wearing the devices,[3] difficulty in noise,[17] lack of perceived benefit, the perceived stigma of wearing the devices,[22] the presence of other more pressing health problems or comorbidities,[34] relying on other's bad experience with hearing aids,[43] and a lack of perceived hearing problem.[32] Whatever the reason may be, it is important to understand that hearing aids are incredible medical devices. They are tools that can change a life and help individuals with hearing loss reconnect with the world around them. Our ability to hear is not just an important part of communication with friends, family, and loved ones, but it can also be critically important for safety. For safe interaction with our surroundings we need to be able to hear things like alarm systems, knocking on the door, and footsteps of someone approaching you. Many individuals with hearing loss will need to become assertive advocates for themselves. Examples include seeking preferential seating at a gathering or restaurant, asking communication partners to rephrase instead of repeat, and acknowledging a hearing loss prior to conversation starting so that if things are missed in conversation, frustration can be avoided.

A fundamental part of hearing aid success is putting forth realistic expectations for hearing aid usage, in that even with the best hearing aid technology it's highly unlikely that hearing aids will perfectly overcome every communication barrier or prevent all communication problems. Hearing aids do not restore normal hearing sensitivity, and with each person having upwards of ten thousand hair cells in their ear, everyone has their own "auditory fingerprint" in that no two hearing losses are going to be the same even if scores are identical on a hearing test. Even more to consider, there are many amplification companies that offer a variety of products and services. With the addition of the signing of the Over the Counter Hearing Aid Act of 2017, to date this market space has expanded further when considering the widely unregulated direct to consumer marketplace. Many of us have received numerous mailed flyers or seen commercials or advertisements for these products. Navigating this space can and making these large investments be extremely confusing for someone pursuing treatment.

This is why it is highly recommended that you consult an ENT physician to rule-out medical involvement related to hearing loss and seek out a

hearing healthcare provider to partner with you and help navigate your own personal hearing health journey. A hearing healthcare professional will be able to work within your unique situation, resources, and support network to help you make the most out of your amplification treatment options. Many clinics work with state assistance programs or other organizations that work with those with limited budget for hearing aids such as the Starkey Hear Now program, Hearstrong organization, and other services such as the Lion's Club hearing aid recycling program (HARP). Hearing healthcare professionals will be able to connect you with these local resources and formulate a plan to help ensure that your treatment plan is optimized for your lifestyle.

Oftentimes hearing aids themselves are not enough to fully address all concerns. Hearing aid wearers may need to consider other hearing assistive technology (HAT) such as telephone amplifiers, caption assistance, telecoil/FM technology, remote microphones, and other alerting devices such as vibrating alarm systems or smoke detectors with strobe lighting. An individualized treatment plan might also include aural rehabilitation classes to help minimize the impact of hearing loss on daily activities and participation. These professionals also can connect candidates with national and local support groups such as the Hearing Loss Association of America (HLAA) and online support forums. These can be great resources to pick up tips and tricks from peers who have overcome similar issues. It is the author's opinion that you should seek out a clinician who offers an evidenced based practice that uses both validation and verification measures (through "real-ear" measurement) to ensure that the devices are working properly. It is also important that candidates be sure to ask which (if any) services are included in the cost of hearing aids, and whether subsequent follow-up care are a part of the pricing model. There are also several YouTube videos that delve into these topics more in detail. Most hearing aid companies also have a lot of information, white papers, and research online that outlines their various features. It's important for everyone considering hearing aids to be an informed consumer and voice their concerns to their hearing healthcare professional.

TYING IT ALL TOGETHER—HEARING AIDS, BALANCE, AND NEW HORIZONS

Hearing aid technology has greatly improved even over the last few years. Going into detail about every hearing aid feature and company is beyond the scope of this article, though some general trends are evidenced across all manufacturers. Hearing aids have become exceptional at taking in information and applying changes automatically based on what environment you're in, with most devices scanning your surroundings and looking

for changes in acoustic information thousands of times each second. This has led to vast improvements when it comes to speech understanding in the presence of background noise, and overall user comfort in challenging listening environments. Form factors, or the shape of the hearing aid shell, has reduced considerably to make hearing aids more cosmetic and low-profile. Rechargeable and lithium ion batteries have been introduced which eliminate the added expense of disposable batteries and the need to change them weekly. Moreover, hearing aids are increasingly user-friendly. Many hearing aids are able to connect directly with smartphones to stream phone calls and media wirelessly. There are several companies that offer free to install apps that allow hearing aid wearers to adjust device volume, create their own soundscapes for various environments, make small programming changes, and help locate the devices if they are lost. Companies also have invested in making their hearing aids durable so they need to be repaired less frequently, with most manufacturers using a nano-coating to make hearing aids more resistant to dust, debris and water. Each manufacturer has a different fitting philosophy and approach toward treating hearing loss, and these should be discussed in more detail with your hearing healthcare professional.

One company, Starkey Hearing Technologies, however, has recently pioneered technology that draws an important connection between hearing and balance—fall detection. In their latest flagship product, the Starkey Livio AI, the hearing aid wearer can select up to three contacts in their Thrive Hearing app who are notified when there is a fall event. When a fall is detected, an audio prompt allows the user to validate whether a reported fall has occurred for 60 seconds before sending an alert with a GPS location to their selected contacts. The contacts can then reach out to the wearer to check in on them. Starkey CTO Anchin Bhowmik detailed this capability at the 2018 Starkey Expo and was featured in The Hearing Review for his description of how this technology could help those with dizziness.[39]

"MAYBE YOU DIDN'T FALL, BUT INSTEAD JUST FELT DIZZY OR WERE OTHERWISE FORCED TO SIT DOWN ON THE FLOOR," EXPLAINS BHOWMIK. "OBVIOUSLY, THIS IS NOT A FALL. BUT YOU CAN STILL USE THE MANUAL ALERT TO GET HELP WHEN YOU NEED IT. BY TAPPING A BUTTON, YOU CAN SEND AN AUTOMATIC ALERT TO YOUR CONTACTS, TELLING THEM YOU NEED ASSISTANCE."

-ANCHIN BHOWMIK, STARKEY CTO

Starkey reports that since their devices work with the vestibular system in the inner ear that work to help stabilize the head and neck, this system is more accurate and less prone to mistakes than other fall detection devices worn on other parts of the body. This is especially true for bilateral users, as these individuals have two fall detection sensors (one in each device) compared to a single unit, which gives rise to better detection and performance. This is just one way that hearing aids are pushing

the boundaries of what these devices can do and how they have multiple functions.

Our understanding of the hearing and balance organs continues to increase and will likely see that these systems are even more connected than we previously knew. As several organizations are now working with Congress to raise awareness and educate policy makers on the effects of hearing loss and the struggles of those seeking treatment, perhaps soon we will see these products become more widely accessible for those that need them.

*This article is intended for informational purposes only. No endorsement is implied.

Tinnitus: Ringing in the Ears

By Vestibular Disorders Association

ARTICLE 068

WHAT IS TINNITUS?

Tinnitus is abnormal noise perceived in one or both ears or in the head. Tinnitus (pronounced either "TIN-uh-tus" or "tin-NY-tus") may be intermittent, or it might appear as a constant or continuous sound. It can be experienced as a ringing, hissing, whistling, buzzing, or clicking sound and can vary in pitch from a low roar to a high squeal.

Tinnitus is very common. Most studies indicate the prevalence in adults as falling within the range of 10% to 15%, with a greater prevalence at higher ages, through the sixth or seventh decade of life. [1] Gender distinctions are not consistently reported across studies, but tinnitus prevalence is significantly higher in pregnant than non-pregnant women. [2]

The most common form of tinnitus is ***subjective tinnitus***, which is noise that other people cannot hear. ***Objective tinnitus*** can be heard by an examiner positioned close to the ear. This is a rare form of tinnitus, occurring in less than 1% of cases. [3]

Chronic tinnitus can be annoying, intrusive, and in some cases devastating to a person's life. Up to 25% of those with chronic tinnitus find it severe enough to seek treatment. [4] It can interfere with a person's ability to hear, work, and perform daily activities. One study showed that 33% of persons being treated for tinnitus reported that it disrupted their sleep, with a greater degree of disruption directly related to the perceived loudness or severity of the tinnitus. [5,6]

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CAUSES AND RELATED FACTORS

Most tinnitus is associated with damage to the auditory (hearing) system, although it can also be associated with other events or factors: jaw, head, or neck injury; exposure to certain drugs; nerve damage; or vascular (blood-flow) problems. With severe tinnitus in adults, coexisting factors may include hearing loss, dizziness, head injury, sinus and middle-ear infections, or mastoiditis (infection of the spaces within the mastoid bone). Significant factors associated with mild tinnitus may include meningitis (inflammation of the membra-nous covering of the brain and spinal cord), dizziness, migraine, hearing loss, or age. [7]

Forty percent of tinnitus patients have decreased sound tolerance, identified as the sum of hyperacusis (perception of over-amplification of environmental sounds) and misophonia/ phonophobia (dislike/fear of environmental sounds).[8] While most cases of tinnitus are associated with some form of hearing impairment, up to 18% of cases do not involve reports of abnormal hearing. [9]

Ear disorders

- **Hearing loss from exposure to loud noise:** Acute hearing depends on the microscopic endings of the hearing nerve in the inner ear. Exposure to loud noise can injure these nerve endings and result in hearing loss. Hearing damage from noise exposure is considered to be the leading cause of tinnitus.
- **Presbycusis:** Tinnitus can also be related to the general impairment of the hearing nerve that occurs with aging, known as presbycusis. Age-related degeneration of the inner ear occurs in 30% of persons age 65–74, and in 50% of persons 75 years or older. [10]
- **Middle-ear problems:** Tinnitus is reported in 65% of persons who have preoperative otosclerosis (stiffening of the middle-ear bones), [11] with the tinnitus sound typically occurring as a high-pitched tone or white noise rather than as a low tone. [12] Otitis media (middle-ear infection) can be accompanied by tinnitus, which usually disappears when the infection is treated. If repeated infections cause a cholesteatoma (benign mass of skin cells in the middle ear behind the eardrum), hearing loss, tinnitus, and other symptoms can result. [13] Objective tinnitus has been associated with myoclonus (con-traction or twitching) of the small muscles in the middle ear. [14,15] Conductive hearing loss resulting from an accumulation of earwax in the ear canal can sometimes cause tinnitus.

Vestibular disorders

Hearing impairment and related tinnitus often accompany dysfunction of the balance organs (vestibular system). Some ves-tibular disorders associated with tinnitus include Ménière's disease and secondary endolymphatic hydrops (resulting from abnormal amounts of a fluid called endolymph collecting in the inner ear) and perilymph fistula (a tear or defect in one or both of the

thin membranes between the middle and inner ear).

Vestibulo-cochlear nerve damage and central auditory system changes

The vestibulo-cochlear nerve, or eighth cranial nerve, carries signals from the inner ear to the brain. Tinnitus can result from damage to this nerve. Such damage can be caused by an acoustic neuroma, also known as a vestibular schwannoma (benign tumor on the vestibular portion of the nerve), vestibular neuritis (viral infection of the nerve), or microvascular compression syndrome (irritation of the nerve by a blood vessel).

The perception of chronic tinnitus has also been associated with hyperactivity in the central auditory system, especially in the auditory cortex. [16] In such cases, the tinnitus is thought to be triggered by damage to the cochlea (the peripheral hearing structure) or the vestibulo-cochlear nerve.

Head and neck trauma

Compared with tinnitus from other causes, tinnitus due to head or neck trauma tends to be perceived as louder and more severe. It is accompanied by more frequent headaches, greater difficulties with concentration and memory, and a greater likelihood of depression. [17]

Somatic tinnitus is the term used when the tinnitus is associated with head, neck, or dental injury—such as misalignment of the jaw or temporomandibular joint (TMJ)—and occurs in the absence of hearing loss. Characteristics of somatic tinnitus include intermittency, large fluctuations in loud-ness, and variation in the perceived location and pattern of its occurrence throughout the day. [18]

Medications

Many drugs can cause or increase tinnitus. These include certain non-steroidal anti-inflammatory drugs (NSAIDs, such as Motrin, Advil, and Aleve), certain antibiotics (such as gentamicin and vanco-mycin), loop diuretics (such as Lasix), aspirin and other salicylates, quinine-containing drugs, and chemotherapy medications (such as carboplatin and cisplatin). Depending on the medication dosage, the tinnitus can be temporary or permanent. [3]

Vascular sources

Pulsatile tinnitus is a rhythmic pulsing sound that sometimes occurs in time with the heartbeat. This is typically a result of noise from blood vessels close to the inner ear. Pulsatile tinnitus is usually not serious. However, sometimes it is associated with serious conditions such as high or low blood pressure, hardening of the arteries (arteriosclerosis), anemia, vascular tumor, or aneurysm.

Other possible causes

Other conditions have been linked to tinnitus: high stress levels, the onset of a sinus infection or cold, autoimmune disorders (such as rheumatoid arthritis or lupus), hormonal changes, diabetes, fibromyalgia, Lyme disease, allergies, depletion of cerebrospinal fluid, vitamin deficiency, and exposure to lead. In addition, excessive amounts of alcohol or caffeine exacerbate tinnitus in some people.

DIAGNOSIS

Examination by a primary care physician will help rule out certain sources of tinnitus, such as blood pressure or medication problems. This doctor can also, if necessary, provide a referral to an ear, nose, and throat specialist (an otolaryngologist, otologist, or neurotologist), who will examine the ears and hearing, in consultation with an audiologist. Their evaluations might involve extensive testing that can include an audiogram (to measure hearing), a tympanogram (to measure the stiffness of the eardrum and help detect the presence of fluid in the middle ear), otoacoustic emissions testing (to provide information about how the hair cells of the cochlea are working), an auditory brainstem response test (to measure how hearing signals travel from the ear to the brain and then within parts of the brain), electrocochleo-graphy (to measure how sound signals move from the ear along the beginning of the hearing nerve), vestibular-evoked myogenic potentials (to test the functioning of the saccule and/or inferior vestibular nerve), blood tests, and magnetic resonance imaging (MRI). Neuropsychological testing is also sometimes included to screen for the presence of anxiety, depression, or obsessiveness—which are understandable and not uncommon effects when tinnitus has disrupted a person's life.

TREATMENT OPTIONS

- **Masking Devices**
- **Tinnitus Retraining Therapy**
- **Psychological Treatments**
- **Medication**
- **Surgery**
- **Complementary and Alternative Treatments**

TREATMENT

If a specific cause of the tinnitus is identified, treatment may be available to relieve it. For example, if TMJ dysfunction is the cause, a dentist may be able to relieve symptoms by realigning the jaw or adjusting the bite with dental work. If an infection is the cause, successful treatment of the infection may reduce or eliminate the tinnitus.

Many cases of tinnitus have no identifiable cause, however, and thus are more difficult to treat. Although a person's tolerance of tinnitus tends to increase with time, [19] severe cases can be disturbing for many years. In such chronic cases, a variety of treatment approaches are available, including medication, dietary adjustments, counseling, and devices that help mask the sound or desensitize a person to it. Not every treatment works for every person.

Masking devices

A masking device emits sound that obscures, though does not eliminate, the tinnitus noise. The usefulness of maskers is based on the observation that tinnitus is usually more bothersome in quiet surroundings [20] and that a competing sound at a constant low level, such as a ticking clock, whirring fan, ocean surf, radio static, or white noise produced by a commercially available masker, may disguise or reduce the sound of tinnitus, thus making it less noticeable. Some tinnitus sufferers report that they sleep better when they use a masker. In some users, maskers produce residual inhibition—tinnitus suppression that lasts for a short while after the masker has been turned off.

Hearing aids are sometimes used as maskers. If hearing loss is involved, properly fitted hearing aids can improve hearing and may reduce tinnitus temporarily. However, tinnitus can actually worsen if the hearing aid is set at an excessively loud level.

Cochlear implants, used for persons who are profoundly deaf or severely hard-of-hearing, have been shown to suppress tinnitus in up to 92% of patients. [21,22] This is likely a result of masking due to newly perceived ambient sounds or from electrical stimulation of the auditory nerve.

Other devices under development may eventually prove effective in relieving tinnitus. For example, the recently introduced acoustics-based

Neuromonics device involves working with an audiologist who matches the frequency spectrum of the perceived tinnitus sound to music that overlaps this spectrum. This technique aims to stimulate a wide range of auditory pathways, the limbic system (a network of structures in the brain involved in memory and emotions), and the autonomic nervous system such that a person is desensitized to the tinnitus. Assessing the true effectiveness of this device will require further scientific study, although observations from an initial stage of clinical trials indicate that the device can reduce the severity of symptoms and improve quality of life. [23]

Tinnitus retraining therapy

Tinnitus retraining therapy (TRT) is designed to help a person retrain the brain to avoid thinking about the tinnitus. It employs a combination of counseling and a non-masking sound that decreases the contrast between the sound of the tinnitus and the surrounding environment. [24] The goal is not to eliminate the perception of the tinnitus sound itself, but to retrain a person's conditioned negative response (annoyance, fear) to it.

In one comparison of the effectiveness of tinnitus masking and TRT as treatments, masking was found to provide the greatest benefit in the short term (three to six months), while TRT provided the greatest improvement with continued treatment over time (12–18 months). [25]

Psychological treatments

Chronic tinnitus can disrupt concentration, sleep patterns, and participation in social activities, leading to depression and anxiety. In addition, tinnitus tends to be more persistent and distressful if a person obsesses about it. Consulting with a psychologist or psychiatrist can be useful when the emotional reaction to the perception of tinnitus becomes as troublesome as the tinnitus itself [19] and when help is needed in identifying and altering negative behaviors and thought patterns.

Medication

No drug is available to cure tinnitus; however, some drugs have been shown to be effective in treating its psychological effects. These include anti-anxiety medications in the benzodiazepine family, such as clonazepam (Klonopin) or lorazepam (Ativan); antidepressants in the tricyclic family, such as

amitiptyline (Elavil) and nortriptyline (Aventyl, Nortrilen, Pamelor); and some selective serotonin reuptake inhibitors (SSRIs), such as fluoxetine (Prozac). [26,27,28,29]

Other drugs have been anecdotally associated with relief of tinnitus. These include certain heart medications, anesthetics, antihistamines, statins, vitamin or mineral supplements, vasodilators, anticonvulsants, and various homeopathic or herbal preparations. Scientific evidence is lacking to support the effectiveness of many of these remedies. [27,30,31] Some appear to be placebos, while some are possibly mildly or temporarily effective but with potential side effects that are serious.

Examples of recent research studies on some of these anecdotal treatments follow, although this list is not exhaustive:

- In assessing the effectiveness of atorvastatin (Lipitor) in the treatment of tinnitus, scientists observed a trend toward relief of symptoms; however, this trend was not statistically significant when compared with results produced by administration of a placebo. [32]
- The relationship between low blood zinc levels and subjective tinnitus was inspected in a small placebo-controlled study. Administration of oral zinc medication produced results that prompted the researchers to note that additional tests were needed to investigate whether duration of treatment might be a significant factor. [33]
- Immediate suppression of subjective tinnitus has been observed in patients administered intravenous lidocaine, [34] although such relief has been shown to be very short term. [35] The effect of such tinnitus treatment is thought to occur in the central auditory pathway rather than in the cochlea. [36]

- Scientists demonstrated that the anti-convulsant gabapentin (Neurontin) is no more effective than placebo in treatment of tinnitus. [37,38]
- When scientists reported their finding that Ginkgo biloba extracts and placebo treatments produce very similar results, they also noted that use of the extract could lead to adverse side effects, especially if used unsupervised and with other medications. [39,40]

PREVENTION

Precautionary measures to help lessen the severity of tinnitus or help a person cope with tinnitus are related to some of the causes and treatments listed above. Avoiding exposure to loud sounds (especially work-related noise) and getting prompt treatment for ear infections have been identified as the two most important interventions for reducing the risk of tinnitus. 47 Wearing ear protection against loud noise at work or at home and avoiding listening to music at high volume can both help reduce risk. 48

Other important factors are exercising daily, getting adequate rest, and having blood pressure monitored and controlled, if needed. Additional precautionary measures include limiting salt intake, avoiding stimulants such as caffeine and nicotine, and avoiding ototoxic drugs known to increase tinnitus (some of which are listed above under "Causes and Related Factors").

Some alternative approaches may eventually yield helpful options in tinnitus treatment. However, most scientists agree that additional well-constructed research is needed before any anecdotally associated preparation can be applied as a proven and effective treatment option.

Surgery

Treating tinnitus with surgery is generally limited to being a possible secondary outcome of surgery that is used in cases when the source of the tinnitus is identified (such as acoustic neuroma, perilymph fistula, or otosclerosis) and surgical intervention is required to treat that condition. [41]

Complementary and Alternative Treatments

Stress-reduction techniques are often advocated for improving general health, as they can help control muscle groups and improve circulation throughout the body. Such relaxation training, the use of biofeedback to augment relaxation exercises, and hypnosis have been suggested as treatments for tinnitus. Limited research is available on the effectiveness of these methods.

Acupuncture, electrical stimulation, application of magnets, electromagnetic stimulation, and ultrasound have been found to be placebo treatments for tinnitus or to have limited scientific support for their effectiveness. [27,30,42,43]

Recent and ongoing research studies have attempted to assess whether transcranial magnetic stimulation could be an effective tinnitus treatment. This application is based on the thought that tinnitus is associated with an irregular activation of the temporoparietal cortex (a part of the brain), and thus that disturbing this irregular activation could result in transient reduction of tinnitus. [44,45,46]

SUMMARY

Tinnitus is a common condition that can disrupt a person's life. Our understanding of the mechanisms of tinnitus is incomplete, and many unknown factors remain. These limitations contribute to the lack of medical consensus about tinnitus management, stimulate continued research efforts, and motivate anecdotal and commercially based speculation about potential but unproven treatments. Prior to receiving any treatment for tinnitus or head noise, it is important for a person to have a thorough examination that includes an evaluation by a physician. Understanding the tinnitus and its possible causes is an essential part of its treatment.

Pharmacologic Treatment

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ARTICLE 050

INTRODUCTION

Vertigo and dizziness are among the most common complaints, having a lifetime prevalence of about 30%[1]. They are symptoms of a variety of disorders that involve the peripheral (otologic vertigo) and/or the central vestibular (brain-induced vertigo) systems. These produce asymmetric input into the central vestibular apparatus or asymmetrical central processing. If this process is acute, vertigo, nausea and vomiting may result. If it is more chronic, dizziness and/or disequilibrium may be the manifest symptoms.

Depending on their etiology, treatment options of vestibular disorders may be summarized as (Table 1, Page 35):

- Pharmacological treatments;
- Liberatory and repositioning maneuver for BPPV treatment (specific maneuvers according to the location(s) of the otoconial debris; Epley and Semont maneuvers are common examples for repositioning debris located in the posterior semicircular canal);
- Vestibular rehabilitation (e.g. exercises for eye and head stabilization, proprioceptive training or habituation exercises);
- Psychotherapeutic measures (particularly important in psychogenic vertigo);
- Surgical treatments - in less frequent lesions such as semicircular canal dehiscence, where there is a lack of bone covering one or more semicircular canals and ear tumors (e.g. vestibular schwannoma); some drugs (namely gentamicin and dexamethasone) may also be applied transtympanically as a simple procedure under topical anesthesia.

With this paper we aim to introduce the reader to the complexity of decision-making when treating vestibular disorders, as well as to analyze the most used pharmacologic strategies for the most common etiologies of vertigo and dizziness.

PREREQUISITES FOR PHARMACOLOGICAL TREATMENT

While vestibular diagnosis has tremendously evolved with the development of new instruments – vHIT (video Head Impulse Test) and VEMP (vestibular evoked myogenic potentials), just to mention a few examples – the treatment of vestibular pathology has undergone many changes not so much by the discovery of new medications, but rather by the use of medications originally used for non-vestibular pathologies. Many of these drugs are still used in off-label manners (i.e., are used in a way not specified in the FDA's approved label). This is because only a few medications have proven, in controlled trials, to be effective. As in all cases and particularly with these drugs, patients should therefore be informed before starting treatment of the balance between risks and benefits.

The prerequisites for successful pharmacological treatment of vertigo and dizziness are the "4 D's" 2: correct diagnosis, correct drug, appropriate dosage and sufficient duration (Table 2, Page 36).

CLARIFYING SYMPTOMS

The first step for successful treatment, establishing a diagnosis, is especially important because vertigo and dizziness are not diseases – they are symptoms: just as headaches, nausea or fever relate to specific pathologic conditions, so do vertigo and dizziness.

Recording a patient's clinical history should search for the clarification of these symptoms:

- Is there vertigo or dizziness? With vertigo the patient will have a sensation of false or distorted self-motion.
- Are the patient's symptoms spontaneous or triggered (e.g., by head movement or position changes)?
- How long has the patient had symptoms, and how often do they occur? When did symptoms first begin?
- Are there accompanying symptoms, namely ear symptoms or neurological symptoms?

Clinical examination is also mandatory for diagnosis and should be carried out in every patient. Eye movement evaluation is one of the major windows in this respect because particular eye movements are evoked by particular vestibular conditions. A precise and brief neurological and otological examination should also be conducted.

TABLE 1: VERTIGO AND DIZZINESS TREATMENT OPTIONS
Pharmacological
Liberatory and reposition maneuvers
Vestibular rehabilitation
Psychotherapeutic measures
Surgical treatments

Treatment is dictated by the patient's diagnosis. The use of medication for the treatment of vestibular disorders may be directed to treat the etiology, control the symptoms, accelerate central compensation or diminish the psychological comorbidity that often accompanies the syndrome (Table 3, Page 36).

There are six major groups of drugs that can be used for to treat vertigo and dizziness (Table 4, Page 37): antiemetics; anti-inflammatories, anti-Ménière's, anti-migrainous; antidepressants and anticonvulsants.

PHYSIOLOGY

Vertigo is the illusion of rotational motion. Most vertigo with definable cause is otologic, caused by dysfunction of the labyrinth in the inner ear. Normal persons continuously process three types of sensory input: visual, vestibular (inner ear) and somatosensory (sense for position and movement of body parts) to estimate the orientation and motion of the head and body. Physiologic and pathologic vertigo is caused by asymmetric input into the central vestibular apparatus or asymmetrical central processing. Many pathways and neurotransmitters are involved in causing the vertigo and autonomic complaints. This explains why so many classes of drugs are used in the management of this disorder. Occasionally in some oculomotor disturbances accompanied by nystagmus (rhythmic and involuntary eye movement) the patient can feel oscillopsia: the illusion that the world is jumping or swinging back and forth. There are some medications to diminish this disabling symptom and improve the visual support (e.g. clonazepam for certain cerebellar induced nystagmus).

In addition to the symptom of vertigo, motion sickness (the malaise and nausea which may follow real or illusory sensations of motion) should also

TABLE 2: PREREQUISITES FOR PHARMACOLOGICAL TREATMENT
Correct diagnosis
Correct drug
Appropriate Dosage
Sufficient duration

TABLE 3: MEDICATION TARGETS IN VERTIGO AND DIZZINESS
Treat the etiology
Control the symptoms
Accelerate central compensation
Diminish the psychological comorbidity

be considered. Vertigo and motion sickness are not synonymous. For example, reading in a moving car may, in susceptible persons, induce nausea and autonomic symptoms but not the false sensation of self-motion.

VERTIGO AND DIZZINESS PHARMACOLOGICAL APPROACH

Clinically, treatment options for patients with vertigo include symptomatic, specific and prophylactic approaches. Symptomatic treatment involves controlling the acute symptoms and autonomic complaints (e.g., vertigo and vomiting). Specific treatment involves targeting the underlying cause of the vertigo (e.g., ear infection). Prophylactic treatment aims to reduce the recurrence of specific vertiginous conditions, as in Ménière's disease, migrainous vertigo or vestibular paroxysmia.

SYMPTOMATIC CONTROL: VESTIBULAR SUPPRESSANTS AND ANTIEMETICS

Symptomatic control involves managing the acute symptoms and autonomic complaints (e.g., vertigo and vomiting). There is a connection between the part of the brain involved in vomiting and the vestibular system. If the vestibular system is strongly stimulated, either by real motion or by vertigo, the vomit center becomes active and nausea and vomiting occurs. Nausea and vomiting can be even more stressful than vertigo itself, therefore being one of the main targets for pharmacological treatment. Other associated symptoms named "autonomic symptoms" are pallor, swelling, salivation, diarrhea and abdominal distention.

TABLE 4. DRUG GROUPS IN VERTIGO AND DIZZINESS TREATMENT
Anti-inflammatories
Anti-migrainous
Anticonvulsants
Anti-Ménière's
Antidepressants
Antimetics

VESTIBULAR SUPPRESSANTS

Vestibular suppressants are drugs that reduce the intensity of vertigo and nystagmus evoked by a vestibular imbalance. These also reduce the associated motion sensitivity and motion sickness. Conventional vestibular suppressants consist of three major drug groups: anticholinergics, antihistamines and benzodiazepines.

BENZODIAZEPINES

Diazepam (Valium®), clonazepam, lorazepam and alprazolam are benzodiazepines commonly prescribed for their effect as anxiolytics and antidepressants. These drugs also act as vestibular suppressants and can, in small dosages, be extremely useful for the management of acute vertigo[3]. They are also useful in controlling motion sickness[4] and can also minimize anxiety and panic associated with vertigo. Habituation, impaired memory, increased risk of falling and vestibular compensation are potential side effects. Their use as vestibular suppressants should therefore be limited in time. Nevertheless, they should not be stopped suddenly because of potential withdrawal syndrome.

ANTIHISTAMINES

Antihistamines include meclizine (Antivert®), dimenhydrinate, diphenhydramine (Benadryl®) and promethazine. These drugs can prevent

motion sickness and reduce the severity of symptoms even if taken after the onset of symptoms[5]. Dry mouth and blurry vision are side effects that result from their anticholinergic action.

ANTICHOLINERGICS

Anticholinergics are vestibular suppressants that inhibit firing in vestibular nucleus neurons[6] as well as reduce the velocity of vestibular nystagmus in humans. The most effective single anticholinergic drug for the prophylaxis and treatment of motion sickness is scopolamine. All anticholinergics conventionally used in the management of vertigo or motion sickness have prominent side effects, often including dry mouth, dilated pupils and sedation.

ANTIEMETICS

Antiemetics are drugs that are commonly used to control vomiting and nausea. The choice for vertiginous patients depends upon the route of administration and the side effect profile. Injectables are mostly used in the emergency room or inpatient settings. Dexamethasone (Decadron®) and ondansetron (Zofran®) are powerful and well-established inpatient-setting antiemetics. While not FDA approved, droperidol (Droleptan®) is widely used outside the U.S. The oral agents are only used for mild nausea, with sublingual administration preferable for outpatients. When an oral agent is appropriate, meclizine or dimenhidrinate (Dramamine®), antihistamines commonly used also as vestibular suppressants, are generally the first to be used because they rarely cause adverse effects any more severe than drowsiness. Phenothiazines, such as prochlorperazine (Compazine) and promethazine (Phenameth®, Phenergan®), are also effective antiemetics but side effects include sedation and the possibility of extrapyramidal symptoms (dystonia and Parkinsonism). Drugs that speed gastric emptying, such as metoclopramide (Reglan®) and Domperidone may also be helpful in managing vomiting[7].

TREATMENT OF INDIVIDUAL SELECTED CONDITIONS

VESTIBULAR NEURITIS

Vestibular neuritis is the most common cause for acute vestibular syndrome (acute vertigo with acute nystagmus). Although it is believed to be caused by the reactivation of a virus (Herpes simplex virus: type 1) in the vestibular

nerve (vestibular neuritis), it does not benefit from antiviral treatment but rather from methylprednisolone (Medrol®), a corticosteriod. In fact, this drug alone has proven to significantly improve the recovery of peripheral vestibular function in patients with vestibular neuritis[8].

Symptomatic treatment should also be provided in the first days (symptomatic control: vestibular suppressants and antiemetics). In the emergency room Dexamethasone, also a corticoid, may be particularly useful for both its anti-emetic and anti-inflammatory properties. Treatment with vestibular suppressors should be discontinued once the acute symptoms are controlled; chronic treatment with these drugs is discouraged to prevent the inadequate compensation. Vestibular rehabilitation has shown to be most effective strategy in reaching complete clinical recovery[9].

VESTIBULAR MIGRAINE

This long-ignored condition is currently recognized as one of the most common causes for vertigo and dizziness. A number of criteria have to be addressed, but simplistically both migraine and vertigo or dizziness must be related in time in order to diagnose this condition. The treatment includes trigger avoidance, pharmacotherapy and vestibular rehabilitation. For acute attacks only symptomatic control is eventually effective (symptomatic control: vestibular suppressants and antiemetics) as migraine abortive agents such as triptans have reached inconclusive results. Prophylactic treatment protocols are based on the ones from migraine headache, and include beta-blockers such as propranolol or metoprolol; calcium-channel blockers such as verapamil, antidepressants such as amitriptyline, fluoxetine, or venlafaxine[10]; anticonvulsants such as valproate or topiramate, and carbonic anhydrase inhibitors such as acetazolamide.

MÉNIÈRE'S DISEASE

Ménière's disease is the second most common cause of vertigo of otologic origin and is classically attributed to dilation and periodic rupture of the endolymphatic compartment of the inner ear. The pathognomonic symptoms include episodic vertigo, ipsilateral fluctuating hearing loss,

aural fullness and tinnitus[11]. The treatment should therefore address these symptoms, i.e. stop vertigo attacks, abolish tinnitus and reverse or preserve the hearing loss. Clinically the pharmacological treatment is addressed at the acute episode management, prevention of new attacks and the treatment of audio-vestibular dysfunction. There is no consensus on prophylaxis of Ménière's syndrome, with major differences between the U.S. and Europe regarding whether betahistine offers therapeutic benefits.

The treatment during the attack is symptomatic and similar to other etiologies of spontaneous vertigo, with vestibular suppressors and antiemetics being the most appropriated strategies. Irrespective of the prophylactic treatment used, remission may eventually occur in 60% to 80% of cases[12-13]. At start, patients should follow dietary salt restriction (1-2 gram salt diet) and adequate hydration (35 ml/kg of liquids). Patients should also avoid caffeine and stop smoking. If the patient does not achieve a good control of symptoms by following this regimen, a mild diuretic, such as Dyazide® or Maxide® (hydrochlorothiazide-triamterene), may reduce the frequency of attacks[14]. It should be noted that diuretics may cause significant hyponatremia and low blood pressure, especially in the elderly and in those who are already on salt-restricted diets.

This treatment with betahistine regimen is widespread worldwide, with a survey in England reporting that 94% of ENT surgeons prescribe betahistine to their Ménière's patients[14]. The underlying mode of action is believed to be through increased inner-ear blood flow, with local vasodilation and increased permeability, thereby relieving pressure from the inner ear. A long-term high-dose treatment with betahistine (at least 48 mg three times daily), has shown a significant effect on the frequency of the attacks[15]. Some patients also respond well to corticoids. Studies on transtympanic steroids have shown evidence of good preservation of hearing and tinnitus control with substantial decrease in the number of vertigo spells16. Before considering nonconservative measures, using transtympanic steroids could be a good approach in patients refractory to betahistine, those with bilateral Ménière's and those with relatively good hearing in the affected ear.

Patients with Ménière's disease may become disabled by recurrent vertigo; in this situation surgical treatment to inactivate all or part of the labyrinth could correctly be indicated.

In recent years, Ménière's treatment has been revolutionized by the use of transtympanic "low-dose gentamicin." In 1997, Driscoll reported that a single dose of gentamicin through the eardrum eliminated recurrent vertigo in 84% of his patients[17]. This procedure has made it possible to control vertigo after other drug treatments have failed.

There is not much evidence that treatment of chronic audio-vestibular dysfunction prevents further progression of hearing loss. Hearing aids and vestibular rehabilitation could be indicated.

VESTIBULAR PAROXYSMIA – NEUROVASCULAR CROSS-COMPRESSION

Vestibular paroxysmia is believed to be caused by the neurovascular compression of the cochleovestibular nerve, as it occurs with other neurovascular compression syndromes (e.g. trigeminal neuralgia). The irregular and unpredictable spells are the most disabling aspect of this condition, making some daily activities, like driving, extremely dangerous. In theory, given its pathophysiology, surgical treatment could be considered. Still, due to the substantial surgical risks involved, this approach is reserved for particular cases where pharmacological treatment is not effective or tolerated. Treatment with carbamazepine (Tegretol®) or oxcarbamazepine (Trileptal®), both anticonvulsants primarily used in the treatment of epilepsy, is usually not only effective in small dosages, but is also diagnostic. Vestibular depressants are not effective.

CONCLUSIONS

Together with physical therapy and lifestyle changes, the pharmacological approach is one of the three pillars for vestibular disorder treatment. The use of medication in each case comes from a proper assessment of symptoms, severity of disease and side effects. Vestibular suppressants should only be used in acute cases to alleviate the stressful symptoms because prolonged use may generate a chronic vestibular imbalance. Preventive medications generally do not cure the underlying disease but may decrease or abolish the number of attacks of vertigo and dizziness. Most of the drugs used for vertigo treatment act specifically on certain receptors or ion channels, but there are several neurotransmitters and pathways involved in causing the vertigo and autonomic complaints. The knowledge of some of these pathways and drug mechanisms has enabled recent advances in the treatment of specific vestibular disorders, such as vestibular migraine, vestibular paroxysmia or some central nystagmus. Still, the main focus should be kept on establishing a correct diagnosis, then developing an effective treatment regime, for patients suffering from vertigo and dizziness.

Surgery for Peripheral Vestibular Disorders

By the Vestibular Disorders Association

ARTICLE 067

WHEN IS SURGERY NECESSARY?

When medical treatment isn't effective in controlling vertigo and other symptoms caused by vestibular system dysfunction, surgery may be considered. The type of surgery performed depends upon each individual's diagnosis and physical condition.

Surgical procedures for peripheral vestibular disorders are either corrective or destructive. The goal of corrective surgery is to repair or stabilize inner ear function. The goal of destructive surgery is to stop the production of sensory information or prevent its transmission from the inner ear to the brain.

LABYRINTHECTOMY

A labyrinthectomy is a destructive procedure used for Ménière's disease. The balance end organs are removed so that the brain no longer receives signals from the parts of the inner ear that sense gravity and motion changes. The hearing organ (cochlea) is also sacrificed with this procedure.

VESTIBULAR NERVE SECTION

A vestibular nerve section is a destructive surgery used for Ménière's disease. The vestibular branch of the vestibulo-cochlear nerve is cut in one ear to stop the flow of balance information from that ear to the brain. The brain can then compensate for the loss by using only the opposite ear to maintain

balance.

CHEMICAL LABYRINTHECTOMY

A chemical labyrinthectomy is also known as transtympanic or intratympanic treatment or gentamicin infusion. This is a destructive procedure used for Ménière's disease. An antibiotic called gentamicin is introduced into the middle ear and absorbed via the round window. The drug destroys the vestibular hair cells so that they cannot send signals to the brain.

ENDOLYMPHATIC SAC DECOMPRESSION

Endolymphatic sac decompression is a stabilizing procedure sometimes used for Ménière's disease or secondary endolymphatic hydrops to relieve endolymphatic pressure in the cochlea and vestibular system. A variety of techniques exist. One method involves allowing the sac to decompress by removing the mastoid bone surrounding it. Other methods involve inserting a shunt (a tube or strip) into the endolymphatic sac so that, theoretically, excess fluid can drain out into the mastoid cavity or other location. The effectiveness of decompression techniques in controlling vertigo remains in doubt.

OVAL OR ROUND WINDOW PLUGGING

Oval or round window plugging is a stabilizing procedure sometimes used for repair of perilymph fistulas. Openings in the oval and/or round windows are patched with tissue taken from the external ear or from behind the ear so that perilymph fluid does not leak through the fistulas.

PNEUMATIC EQUALIZATION (PE) TUBES

Pneumatic equalization (PE) is a stabilizing procedure sometimes used for treating perilymph fistulas. A tube is inserted through the tympanic membrane (eardrum) with one end in the ear canal and the other in the middle ear, to equalize the air pressure on the two sides of the eardrum.

CANAL PARTITIONING (CANAL PLUGGING)

Canal partitioning is a stabilizing procedure sometimes used for treating

BPPV or superior semicircular canal dehiscence. The problematic semicircular canal is partitioned or plugged with small bone chips and human fibrinogen glue to stop the movement of endolymph and foreign particles within the canal so that it no longer sends false signals to the brain.

MICROVASCULAR DECOMPRESSION

Microvascular decompression is performed to relieve abnormal pressure of the vascular loop (blood vessel) on the vestibulo-cochlear nerve.

STAPEDECTOMY

Stapedectomy is a stabilizing procedure sometimes used for otosclerosis. It is accomplished by replacing the stapes bone with a prosthesis.

ACOUSTIC NEUROMA (VESTIBULAR SCHWANNOMA) REMOVAL

This procedure involves the removal of a noncancerous tumor that grows from the tissue of the vestibular branch of the vestibulo-cochlear nerve.

CHOLESTEATOMA REMOVAL

This procedure involves the removal of a skin growth that starts in the middle ear and that can secrete enzymes that destroy bone and surrounding structures.

ULTRASOUND SURGERY

Ultrasound is applied to the ear to destroy the balance end organs so that the brain no longer receives signals from the parts of the ear that sense gravity and motion changes.

COCHLEAR DIALYSIS

Cochlear dialysis is a stabilizing procedure sometimes used to promote movement of excess fluid out of the inner ear by filling the scala tympani with a chemical solution.

Vestibular Rehabilitation Therapy (VRT)

By Lisa Farrell, PT, PhD, AT,C; Clinical Faculty, Department of Physical Therapy, Nova Southeastern University, Fort Lauderdale, Florida'

ARTICLE 080

Evidence has shown that vestibular rehabilitation can be effective in improving symptoms related to many vestibular - inner ear - disorders. [1, 2] People with vestibular disorders often experience problems with vertigo, dizziness, visual disturbance, and/or imbalance. These are the problems that rehabilitation aims to address. Other problems can also arise that are secondary to the vestibular disorder like nausea and/or vomiting, reduced ability to focus or concentrate, and fatigue.

Symptoms due to vestibular disorders can diminish quality of life and can impact all aspects of life from economic to social participation as well as can contribute to emotional problems, like anxiety and depression. Additionally, one of the consequences of having a vestibular disorder is that the symptoms frequently cause people to adopt a sedentary lifestyle in order to avoid bringing on, or worsening, dizziness and imbalance that occurs with movement. As a result, decreased muscle strength and flexibility, increased joint stiffness, and reduced stamina can occur from this lifestyle. Treatment strategies used in rehabilitation can also be beneficial for these secondary problems.

WHAT IS VESTIBULAR REHABILITATION?

Vestibular rehabilitation (VR) is a specialized form of therapy intended to alleviate both the primary and secondary problems due to vestibular disorders. It is an exercise-based program primarily designed to reduce vertigo and dizziness, reduce gaze instability, and/or reduce imbalance and fall risk as well as address any secondary impairments that are a consequence of the vestibular disorder.

For most people who have a vestibular disorder, the deficit is permanent because the amount of restoration of vestibular function is very small. However, after vestibular system damage, symptoms can reduce and function can improve because of compensation. This occurs because the brain learns to use other senses (vision and somatosensory - body sense) to substitute for the deficient vestibular system. For many, compensation occurs naturally over time, but for patients whose symptoms do not reduce and who continue to have difficulty returning to daily activities, VR can assist in recovery by promoting compensation. [3]

The goal of VR is to use a problem-oriented approach to promote compensation. This is achieved by customizing exercises to address the specific problem(s) of each individual. Therefore, before an exercise program can be designed, a comprehensive clinical examination is needed to identify problems related to the vestibular disorder. Depending on the vestibular-related problem(s) identified, three principal methods of exercise can be prescribed:

1) Habituation,
2) Gaze Stabilization, and/or
3) Balance Training. [4]

Habituation exercise is used to treat symptoms of dizziness that is produced because of self-motion[3] and/or produced because of visual stimuli. [5, 6] Habituation exercise is indicated for patients who report increased dizziness when they move around, especially when they make quick head movements, or when they change positions like when they bend over or look up to reach above their heads. Also, habituation exercise is appropriate for patients who report increased dizziness in visually stimulating environments, like shopping malls and grocery stores, when watching action movies or T.V., and/or when walking over patterned carpets and shiny floors. The goal of habituation exercise is to reduce the dizziness through repeated exposure to specific movements or visual stimuli that provokes patients' dizziness. These exercises are designed to mildly, or at the most, moderately provoke the patients' symptoms of dizziness. Over time, with good compliance and perseverance, the dizziness intensity can reduce due to the brain learning to ignore the abnormal signal.

Gaze Stabilization exercises are used to improve control of eye movements so vision can be clear during head movement. These exercises

are appropriate for patients who report problems seeing clearly because their visual world appears to bounce or jump around, such as when reading or when trying to identify objects in the environment, especially when moving about. There are two types of eye and head exercises used to promote gaze stability. The choice of which exercise(s) to use depends on the type of vestibular disorder and extent of the disorder.

One example is:

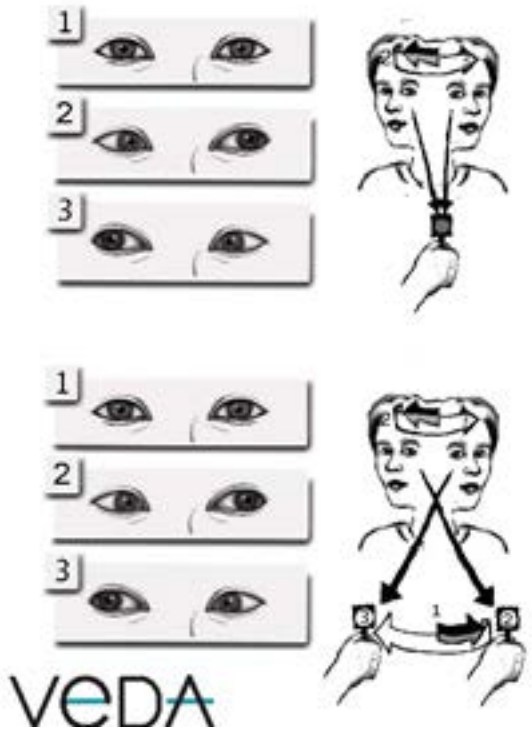

Image by Karen Ilari, © VeDA

Balance Training exercises are used to improve steadiness so that daily activities for self-care, work, and leisure can be performed successfully. Exercises used to improve balance should be designed to address each patient's specific underlying balance problem(s). [7] Also, to promote changes in balance, the exercises need to be moderately challenging, but safe enough so patients do not fall while doing them.

Additionally, balance exercises should be designed to reduce environmental barriers and fall risk. For example, the exercises should help improve patients' ability to walk outside on uneven ground or walk in the dark.

For patients with **Benign Paroxysmal Positional Vertigo (BPPV)**, the exercise methods described above are not appropriate to resolve this type of vestibular disorder. Through assessment, the type of BPPV is identified, and depending on the type, different repositioning maneuvers can be performed to help resolve the spinning that occurs due to position changes. [8, 9]

WHAT SHOULD PATIENTS EXPECT FROM VESTIBULAR REHABILITATION?

VR is usually performed on an outpatient basis, although in some cases, the treatment can be initiated in the hospital. Patients are seen by a licensed physical or occupational therapist with advanced post-graduate training.

VR begins with a comprehensive clinical assessment that should include collecting a detailed history of the symptoms and how these symptoms affect daily activities. The therapist will document the type and intensity of symptoms as well as discuss the precipitating circumstances. Additionally, information about medications, hearing or vision problems, other medical issues, history of falls, previous and current activity level, and the living situation will be gathered. The assessment also includes administering different tests to more objectively evaluate the problems. The therapist will screen the visual and vestibular systems with various tests that observe how well eye movements, body movements and balance are being controlled by these systems. The examination may also include tests of: sensation (which includes gathering information about pain), muscle strength, extremity and spine range of motion, coordination and posture.

A customized exercise plan is developed from the findings of the clinical assessment, results from laboratory testing and imaging studies that may have been done, and input from patients about their goals for rehabilitation. An important part of the VR is to establish an exercise program that can be performed regularly at home. Compliance with the home exercise program is essential to help achieve rehab and patients' goals.

ARE VESTIBULAR REHABILITATION EXERCISES DIFFICULT TO DO?

The exercises are not difficult to learn, but that doesn't mean they are easy to do!

The exercises can sometimes be tedious; however committing to doing them is key to helping you achieve success. Setting up a regular schedule so that you incorporate them into your day is very important.

Exercises may, at first, make your symptoms seem worse. But with time and consistent work, your symptoms should steadily improve, and then, you will find that you are able to participate more in the activities of your daily life.

Along with prescribing and progressing exercise, patient and caregiver education is an integral part of VR. Education is important for patients because it takes away much of the mystery of what they are experiencing, which can help reduce any anxiousness that may occur because of the vestibular disorder.

FACTORS THAT CAN IMPACT RECOVERY

When patients participate in VR, different factors can impact the potential for recovery. For example, the type of vestibular disorder affects recovery. Patients that have a stable vestibular disorder, such as vestibular neuritis or labyrinthitis, have the best opportunity to have a satisfactory resolution of symptoms. When patients have a progressive vestibular disorder, like with multiple sclerosis, or a fluctuating condition, like with Migraine and Meniere's, which causes spontaneous attacks of dizziness or vertigo, compensation can be difficult to achieve, and therefore, success with VR is more difficult. There are also differences in response to VR depending on whether you have one or both inner ears involved, or whether the problem lies within the vestibular parts of the brain as opposed to the ear(s).

OTHER FACTORS THAT CAN POTENTIALLY LIMIT RECOVERY
Sedentary lifestyle
Pain
Presence of Other Medical Conditions
Certain Medications or Multiple Medications
Emotional Concerns
Decompensation

Symptomatic relapses can occasionally occur because the brain de-compensates. This can be due to different emotional and/or physical stressors, like personal or job-related pressures, periods of inactivity, a bad cold or flu, extreme fatigue or chronic lack of sleep, changes in medication, or sometimes surgery. [3] Although it is important for patients to consult with their physician to make sure nothing new has occurred, returning to the exercises that promoted the initial compensation can help promote recovery again. Additionally, recovery after de-compensation usually occurs more quickly as compared to the initial compensation.

WHERE CAN I FIND A VESTIBULAR REHABILITATION SPECIALIST?

The Vestibular Disorders Association (VeDA) provides a directory of health professionals who are specially trained to assess and treat vestibular disorders. This online directory offers users the ability to search for providers according to specialty and geographical location. To locate this online directory, visit **vestibular.org/healthcare-directory**.

Dealing with Acute Vertigo Episodes

By Joon Nah, BScPT

ARTICLE 117

Vertigo can be an extremely distressing symptom. The sudden onset of world-turning dizziness and the accompanying nausea, imbalance and loss of function can feel paralyzing and cause great concern.
You're not alone. In fact, nearly 40% of adults in the U.S. will experience vertigo at some point in their lives.

Fortunately, most attacks are not due to serious medical conditions. And there is help available to understand why these symptoms occur and how to improve your condition.

Here are some tips to help you deal with vertigo, when it happens.

SEEK MEDICAL HELP

Get to an Acute Care Center or the Emergency Department for the following:

- If this is the first time you've experienced a vertigo attack
- If your symptoms of vertigo, nausea, vomiting are worsening
- If you have trouble with any of the following:
    - Speaking or swallowing
    - Double vision or loss of vision
    - Loss of coordination of your hands, fingers, feet
    - Weakness or loss of sensation in one or more of your limbs
    - Severe headache that is not typical to you.

If your attack is similar to a previous one, then you'll likely benefit from seeing your family doctor or a vestibular rehabilitation professional, such as a

vestibular physical therapist.

GET TO A SAFE PLACE

Vertigo episodes can result in problems with vision and balance, and cause you to feel disoriented. Your personal safety is top priority.

- Move away from roads, unstable ground, and nearby obstacles.
- Move slowly keeping your head straight and walk near walls and hand rails
- Focus on a spot in front of you
- Sit or lie down. If lying, elevate your head with an extra pillow.
- Find a quiet, dark place. Use ear plugs or headphones if you need to and close your eyes.

MEDICATIONS

Some medications can help by acting as antihistamines and vestibular suppressants, which can calm down the overactive balance centers in your inner ear. Your doctor may suggest meclizine, dimenydrinate, Betahistine, scopolamine, and other similar drugs.

If you can feel signs that a vertigo attack is coming on, taking these preventatively can give you even greater control over your dizziness episode. Remember, these medications are only intended for short-term use.

REDUCING YOUR NAUSEA

Nausea is often the most disabling symptom of a vertigo attack. The following are common aids to reduce nausea and improve your tolerance to dizziness.

- Ginger and peppermint (tea, capsules, dietary)
- Essentials oils (applied to points on the body or using with a diffuser)
- Inhale alcohol prep pads or wipes
- Acupressure applied to your forearm, an inch away from your wrist (or by using motion sickness bands)
- Cannabidiol (CBD), usually taken as oil drops or edibles. Warning: products with active THC can actually

STRATEGIES FOR DEALING WITH VERTIGO
Seek medical help
Get to a safe place
Take medication
Recude nausea
Practice relaxation
Avoid triggers
Create a plan

increase dizziness, further worsening nausea.
- Stay hydrated with lots of fluids

RELAXATION TECHNIQUES

Acute vertigo is usually caused by hyperactivity issues with your brain's balance sensing system. Relaxation strategies can directly calm these areas down, reducing your overall dizziness.

- Understanding that vertigo is usually not a serious condition can help reduce anxiety
- Practice slow and deep breathing
- Learn to meditate using online resources, smartphone/tablet apps, or by contacting a therapist such as a social worker or psychologist

CREATE A PLAN

If you suffer from repeated episodes of acute vertigo, your best defense is preparation. An attack can make you feel confused and disoriented, and they typically don't occur on a schedule. So have a plan prepared and ready to go.

1. Have your medications and aids (anti-nausea pills, dizziness suppressants, seasickness bands etc.) nearby in your purse, desk or car.
2. Keep your medical ID with you.
3. Keep a short list of people you can call if you have an attack. Mark them as "favorites" on your phone's contact list.
4. Most importantly, don't keep your dizziness condition a secret. Let friends, family and co-workers know that you experience potential vertigo attacks. Help them understand how you may react and in what ways they can assist you.

AVOID OR REDUCE TRIGGERS

The following are common triggers that can provoke dizziness, particularly in the midst of an attack. Be mindful of them, and avoid when possible.

- Decrease alcohol, caffeine and tobacco use
- Reduce your salt intake
- Keep your blood sugar level stable. Try to eat small meals and often. Avoid high sugar foods and drinks that can spike your insulin levels.
- Avoid situations or activities that cause you to feel stress
- Try to limit the specific movements and activities that directly increase your dizziness until your symptoms have settled past the initial, acute stage

ADDITIONAL CONSIDERATIONS

If vertigo is new to you, avoid end-range head movements (e.g. looking all the way up and turning your head as far as it can go). In some rare

circumstances, vertigo can be caused by blood flow issues in your neck.

As the acute phase of your condition subsides, the best advice for reducing your symptoms can differ significantly from what is outlined here. Find a health professional that understands dizziness and get help. Search for a vestibular specialist using VeDA's Healthcare Directory here: **https://vestibular.org/healthcare-directory/**

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