Complementary and Integrative Treatments Balance Disorders

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KEYWORDS

• Integrative • Balance disorder • Acupuncture • Holistic • Vertigo
• Complementary therapy

KEY POINTS

- Antihistamines, benzodiazepines, anticholinergics, calcium channel blockers, neuroleptics, and antidepressants all may achieve reduction in the length and severity of dizzy spells. Their use is not recommended long-term.
- Vestibular rehabilitation therapy is a program of physical therapy designed to habituate symptoms and promote adaptation to various deficits engendered by an array of balance disorders.
- Several essential micronutrients are vital for proper balance; therefore identification and supplementation of deficiencies are crucial for patients with symptoms of balance disorders.
- Acupuncture may be used for patients with Menière disease and for relief of vertigo.
- Tai chi has been studied as an aid to improving balance, and studies suggest that it can reduce falls or risk of falls.
- Osteopathic manipulative therapy has been described for disorders of dizziness and balance.
- Cognitive-behavioral therapy, with its emphasis on challenging distorted thinking to change maladaptive behavior, has been recommended as an adjunct to vestibular rehabilitation. Dialectical behavior therapy, which incorporates mindfulness, has been helpful in difficult or treatment-resistant cases.

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OVERVIEW

Balance disorders are the ninth most common reason that patients seek medical care from their primary care doctors, and result in 2 million office visits annually.[1] The balance system is complex, integrating the functions of the vestibular, visual, and proprioceptive systems. A dysfunction in any of these may result in imbalance.[2] Imbalance disproportionately affects elderly individuals, and dizzy complaints are the chief reason why persons older than 75 years seek medical attention. Falls are the leading cause of serious injury and death in those older than 65 years.[3] New research points out that changes in gait and balance may be the earliest signs of Alzheimer disease or incidental dementia.[4]

PHYSIOLOGY AND ANATOMY

Balance is defined as the ability of the body to maintain its center of mass over its base. Its ability to do so also encompasses being able to judge direction and speed of movement and orientation with respect to gravity. It allows us to see clearly when we are moving and make adjustments in our posture, resulting in stability in a variety of environments.

In humans, the balance system comprises 3 parts:

- a peripheral sensory apparatus
- a central processor
- a motor output mechanism

Peripheral sensors include the vestibular organs as well as the eyes and the muscles and joints. The vestibular labyrinth contains 2 types of sensors: the semicircular canals and the otolith organs. There are 3 paired semicircular canals:

- the horizontal
- superior
- posterior

They are roughly orthogonal to one another and sense angular velocity of the head in their respective planes. For example, lateral motion of the head stimulates the horizontal canals, whereas up and down motion stimulates the vertically oriented canals. The canals are housed in the dense bony labyrinth of the temporal bone and contain perilymph, which has a composition similar to cerebrospinal fluid (CSF) with a high sodium/potassium ratio. Perilymph is in communication with CSF via the cochlear aqueduct, and therefore disorders of CSF pressure may affect inner ear function.

Inside the bony labyrinth and suspended in the perilymph is the membranous labyrinth, which is filled with endolymph and has an opposite composition to CSF, with a high potassium/sodium ratio. An enlarged area within each canal, the ampulla, contains a gelatinous cupula matrix, which completely seals the canal. Movements of the head trigger deformation of the matrix material and cause underlying specialized hair cells to activate, sending signals to the vestibular nerve. The otolith organs (the utricle and saccule) are similarly housed. They sense linear acceleration in a left and right orientation and up and down, respectively. Maculae are the sensory transduction means in these organs. An otolithic membrane contains tiny crystals of calcium carbonate, or otoconia, overlying hair cells. Deformation of this membrane by linear acceleration or change of orientation with respect to gravity induces electrical changes within the hair cells, which leads to signaling through the vestibular nerve. These otoconia are constantly being reformed and absorbed by the macular

supporting cells and dark cells, and this process is likely important in the development of benign paroxysmal positional vertigo (BPPV).[5]

The blood supply to the vestibular organs is from the labyrinthine artery, usually a branch of the anterior inferior cerebellar artery. Because no collateral anastomotic network exists to supply the vestibular apparatus, it is extremely sensitive to ischemia; 15 seconds of cessation of blood flow may halt vestibulocochlear nerve excitability.[6]

The nerve supply to the semicircular canals and otolith organs derives from the vestibular nerve, which are afferent projections from the bipolar neurons of the Scarpa ganglion. The vestibular nerve travels from the peripheral sensory organs through the internal auditory canal of the petrous temporal bone to the pontomedullary junction of the brainstem in the posterior fossa. Here, it synapses with cells in the vestibular nucleus as well as the cerebellum. Vestibular neurons are unique among sensory neurons in the body in terms of having a resting discharge rate, making them sensitive, capable of bidirectional responses (inhibitory or excitatory), and able to continuously monitor head motion.[5]

The paired vestibular nuclei are connected by commissures that are mutually inhibitory, allowing sharing and integration of information from the vestibular organs in a push-pull format.[7,8] For example, with the head turned to the right, the right vestibular nerve and nuclei activity are increased, whereas the left vestibular nerve and nuclei activity are decreased. Asymmetric neural activity is therefore interpreted by the central nervous system (CNS) as movement, even when such asymmetry may result from disease.[5]

Ascending pathways from the vestibular nuclei to higher brain centers is important for processing of the vestibulo-ocular reflex (VOR) and vestibular sensations. Descending pathways are significant for vestibulospinal reflexes. Two white matter tracts go to the ocular motor nuclei:

- the ascending tract of Dieter to the ipsilateral abducens nucleus
- the medial longitudinal fasciculus (MLF) to all other ocular motor nuclei

Because the MLF is often implicated in multiple sclerosis, this explains the central vestibular symptoms seen in this disease.[6] Other projections go to the vestibuloautonomic system, leading to nausea and vomiting with vestibular imbalance. The vestibular nucleus also receives sensory input from visual, auditory, proprioceptive, and tactile sources. Because of this multimodal input, patients may have difficulty describing their dizzy complaints.[5]

The cerebellum receives key input from the vestibular nuclei and is essential in the VOR and trunk stability. Lesions in the cerebellum, ranging from tumors and degeneration to Arnold-Chiari malformation and alcoholism with thiamine deficiency, may lead to nystagmus and ataxia, which mimic a peripheral vestibular insult.

Reflex pathway arcs form an important basis in the vestibular system, including the VOR, to maintain stable vision during head motion, to assist in balance and stability. The vestibulospinal reflex helps maintain body stability. Cervical reflexes like the vestibulocollic and cervicocollic reflexes work on neck muscles to stabilize the head.[6]

Proprioceptive information comes from skin, muscle, and joint receptors in the body that are sensitive to stretch or pressure. Sensory input from the neck indicates the direction in which the neck is turned, and cues from the ankles help the brain evaluate the sway or movement of the body with respect to the ground, as well as the quality of the ground: flat, hard, uneven, or slippery. This additional information is useful when conflicting information is being processed, for example, in car sickness. The body is still and appropriate sensors convey this, although the vestibular input suggests movement.

It is up to higher cognitive centers in the brain, including memory, to sort this information out. Learning in the brain involves synaptic reorganization and underlies basic human activity such as balance when learning to walk. Through a process of facilitation, nerve impulses that are repeated down a motor output pathway become easier. This process also explains why practice is useful to athletes.[9,10]

SYMPTOMS

Patients with imbalance may be unsteady when walking, or tend to veer to 1 side. They may describe dizziness, as if spinning, floating, or moving, even when still or lying down. Associated ear symptoms can include hearing loss and tinnitus. Vegetative symptoms of nausea or vomiting may be present. Headache may or may not be present. Visual changes such as diplopia, blurriness, or jumpy vision can occur. Oscillopsia is the blurring of vision with head movement; a walking form occurs wherein patients describe their surroundings as bouncing or bobbing.[11] These episodes may last variably and be chronic. There may be associated triggers like a change in head or body position, walking into a dark room, disembarking from a moving vehicle, foods, stress, diving, exercise, loud noise, alcohol, and heat.[12,13]

A thorough history should elicit all of these factors, and include a full review of systems focusing on the cardiovascular, musculoskeletal, and neurologic systems. Pertinent positives may also be recorded in the endocrine, visual, and psychological system reviews.

Falling may be the result of imbalance. Falls account for up to 50% of accidental deaths in elderly individuals. The annual cost of treating fall-related injuries is projected to cost close to $55 billion dollars by the year 2020.[3]

Several rating scales exist to help quantify the degree of disability experienced by patients as a result of their disequilibrium. These measures include the Dizziness Handicap Inventory and the Activities-Specific Balance Confidence Scale. These tools may give a fuller picture of the impact on patients' quality of life.

MEDICAL TREATMENT APPROACHES

Pharmacotherapy provides symptom relief of dizziness via central mechanisms affecting vestibular suppression. Antihistamines, benzodiazepines, anticholinergics, calcium channel blockers, neuroleptics, and antidepressants all may achieve reduction in the length and severity of dizzy spells. However, none of the medications works to prevent an episode, and many can be addictive and cause drowsiness (ie, benzodiazepines). Thus, their use is not recommended long-term, and using them may prove counterproductive to brain adaptation.[14,15]

A cornerstone of therapy for imbalance is vestibular rehabilitation therapy (VRT). VRT is a program of physical therapy designed to habituate symptoms and promote adaptation to various deficits engendered by an array of balance disorders, among the most serious of which is falls. VRT has been shown to be effective in improving functional deficits and subjective symptoms resulting from vestibular disorders and central balance disorders.[3] It is also effective for children. Studies have shown a customized program to be superior to generic exercise.

VRT uses specialized exercises to enable gaze and gait stabilization. Many of these exercises use head movement, because this is essential in stimulating and retraining the vestibular system. The basis of VRT is existing neural mechanisms that allow for adaptation, plasticity, and compensation. Because of this situation, patient selection criteria are crucial. Optimal candidates are highly motivated, and have intact cognitive, cerebellar, visual, and proprioceptive systems. For

example, studies show that VRT offers little benefit to patients with cerebellar dysfunction.[3]

Typically, patients are referred if symptoms persist for greater than 2 to 3 months. This is the time period it takes the brain to recover from a vestibular injury. However, recent reports suggest that VRT may be efficacious even for acute vertigo, lessening the need for medicine and shortening the duration of symptoms.[16] After vestibular schwannoma resection, early VRT offered to patients resulted in improved outcomes when compared with a control group.[17]

VRT uses the following strategies:

- substitution
- adaptation
- habituation

Substitution strategies involve several techniques, applying alternate senses to replace lost vestibular function by biasing away from the dysfunctional vestibular input.[3] An example is developing the cervico-ocular reflex to stabilize vision during head movements. Habituation involves desensitizing the vestibular system. Cawthorne head exercises, first described in the 1940s, use eye, head, and body movements in a provocative fashion to stimulate vestibular signs and symptoms and fatigue the vestibular response, forcing the CNS to compensate. Adaptation refers to long-term changes in neural pathways that seek to reestablish homeostasis within the vestibular system. Several VOR exercises help facilitate the gain, timing, and direction of the VOR response.

In addition to VOR exercises, ocular motor exercise, gait exercise, and balance exercise are prescribed. An obstacle course may be set up to simulate challenging environments that patients may face in the real world. Virtual reality computer technology is being used for oscillopsia[11] as well as for NASA (National Aeronautics and Space Administration) astronaut training to increase function in space and speed recovery when returning to gravity and a ground environment. Electrotactile vestibular substitution systems have been used for patients with bilateral vestibular loss, as in aminoglycoside toxicity.[3] A new twist on VRT is working with patients in a pool environment. Researchers in Brazil[18] using aquatic physiotherapy for patients with uncompensated unilateral vestibular loss found “improvement in quality of life, body balance and self-perception of dizziness intensity, regardless of age, time since symptom onset, and use of antivertigo medication.”

SURGICAL TREATMENT APPROACHES

Surgery is reserved for individuals who have failed medical therapy. It is typically indicated in patients with Menière disease with disabling features. Intervention is not indicated in cases of bilateral vestibular dysfunction. Surgical procedures include endolymphatic sac surgery, vestibular nerve section, and chemical labyrinthectomy.[14] Other potential surgical remedies include:

- perilymphatic fistula repair
- occlusion of the posterior semicircular canal in BPPV versus division of the singular nerve[19]
- middle cranial fossa versus transmastoid repair of superior semicircular canal dehiscence syndrome.[15]

Persistent disequilibrium, hearing loss, and CSF leak are potential complications from surgery.

PATIENT SELF-TREATMENTS

In the case of BPPV, particle repositioning maneuvers may be used by patients at home. These maneuvers include the Epley and Semont maneuvers, and Brandt-Daroff exercises. These activities attempt to remove wayward otoconia in the semicircular canals into a less sensitive location.[12,19] Although such maneuvers have a median efficacy of 80%, nearly a third of patients experience recurrent symptoms within a year.

A commercially available product, DizzyFix, is a plastic molded headband type device that may assist patients with getting into the correct position for particle repositioning maneuvers. Several small studies suggest it to be comparable with office-based procedures.[20]

INTEGRATIVE TREATMENT APPROACHES

Vitamin B_{12} (Cyanocobalamin)

Several essential micronutrients are vital for proper balance; therefore, identification and supplementation of deficiencies are crucial for patients with symptoms of balance disorders. Vitamin B_{12}, or cyanocobalamin, is a critical micronutrient for vestibular health. Deficiency causes damage to the myelin sheath of neurons and can lead to numbness and tingling of the legs, difficulty walking, and disorientation. Neurologic symptoms may be predominant in 25% of individuals deficient in vitamin B_{12}. It is estimated that 10% to 15% of adults older than 60 years suffer from such a deficiency. One reason is that the incidence of atrophic gastritis in the elderly population is between 10% and 30%.[21] Gastric parietal cells secrete intrinsic factor, which is needed to bind to vitamin B_{12} for its absorption in the small intestine. Anti-intrinsic factor antibodies may be present in pernicious anemia, an autoimmune inflammation of the stomach lining. Also, the widespread use of gastric acid–suppressive drugs may play a similar role in leading to decreased food-based absorption, because acid is required to free the vitamin B_{12} found in foods.

The US recommended dietary allowance (RDA) for vitamin B_{12} in adults is 2.4 μg/d. No upper limit is set on the daily intake. It is found in animal products, and therefore vegetarians need supplemental sources. Oral and injectable forms are readily available.

Vitamin B_1 (Thiamine)

In Wernicke-Korsakoff syndrome, patients experience nystagmus, gait abnormality, and confusion. This syndrome is brought on by a lack of vitamin B_1 or thiamine. It is usually caused by a poor diet associated with alcoholism.[22] Treatment involves thiamine supplementation, although the dose, duration, frequency, and route of administration are unclear.[23] The US RDA for thiamine is 1.2 mg/d in adult men and 1.1 mg/d in women. Vitamin B_1 is found in legumes, nuts, and whole grain cereals.

Vitamin D

Vitamin D, in conjunction with calcium and sodium fluoride, showed promise in the management of inner ear otosclerosis in some patients, from a report by Brookler and Glenn.[24] These investigators suggest that there are “patients with symptoms similar to those of Menière’s disease who do not have Menière’s disease and therefore do not respond to conventional medical or conservative surgical management. Some have subtle disorders of carbohydrate and lipid metabolism” and are remedied by dietary therapy.

Antioxidant Compounds

Antioxidant compounds have been studied for vertigo symptom relief. A study from Japan looked at vitamin C (600 mg/d), glutathione (300 mg/d), and rebamipide (300 mg/d) in patients with Menière disease who had failed conventional therapy. This small pilot study[25] found "marked improvement of vertigo" in 21 of 22 patients. These compounds act by limiting the free-radical damage to tissue, cell membranes, and DNA. Because glutathione is poorly absorbed, precursor compounds such as lipoic acid or *N*-acetylcysteine may be substituted.[26]

Ginkgo Biloba

Among herbal remedies, ginkgo biloba has been one of the most studied. Properties of ginkgo include being an efficient free-radical scavenger and inhibiting platelet activation factor. Researchers in Italy[27] examined the ginkgo biloba extract EGb761 in patients with vertigo of vascular origin. These investigators used a dose of 80 mg twice daily for 3 months. Neuro-otologic and balance examinations were performed at baseline and on study completion. "Considerable" improvement was found in oculomotor and visuovestibular function, although no change was noted in the overall equilibrium score.

A national committee tasked with studying the then known effects of popular herbal treatments in Germany published their findings as the German Commission E monograph in 1994. For ginkgo, they concluded that EGb761 "aids in the compensation of disturbed equilibrium, acting particularly at the level of the microcirculation."[28–30] The Commission recommended doses in the 120-mg to 240-mg range per day, divided in 2 or 3 separate doses, for vertigo or tinnitus of vascular or involutional origin. In a study carried out in Taiwan, researchers found that elderly patients with dizziness, vertigo, and findings of leukoaraiosis ("a diminution of density in the white matter, related to a specific type of cerebral ischemia, which has been identified as a low-density area on a computed tomographic scan or high signal intensity on a T2-weighted magnetic resonance imaging scan") who were treated with a plasma expander (hydroxyethyl starch) for 3 days, followed by ginkgo (40 mg), a daily multivitamin, and oxazolam twice daily, for 3 months, had improvement with their vertigo and balance.[31] Side effects from ginkgo extract taken over a 3-month period included nausea, headache, stomach problems, diarrhea, allergy, anxiety, and sleep disturbance in 1.69% of more than 10,000 patients evaluated.[28]

Vertigoheel

Homeopathic treatments use the principle of like treats like, such that compounds that may instigate a particular symptom are used in the treatment of that symptom in serially diluted quantities; 1:10 (X) or 1:100 (C) dilutions, or multiples thereof. One homeopathic remedy, Vertigoheel (Biologische Heilmittel Heel, Baden-Baden, Germany), consists of *Cocculus indicus* 4 × 210 mg, *Conium masculatum* 3 × 300 mg, and *Ambra grisea* 6 × 30 mg, petroleum 8 × 30 mg.[29] A randomized, double-blind trial was performed in 2005 of 170 elderly patients with atherosclerosis-related vertigo to assess the noninferiority of Vertigoheel versus ginkgo biloba.[32] After 6 weeks of treatment, both groups improved by approximately 10 points on a dizziness scale. Further corroborative tests, such as line walking and the Unterberg stepping test, confirmed physician and patient global assessment of improvement. A systematic review from 2007[33] found good levels of evidence for the use of Vertigoheel in the treatment of vertigo but larger trials are required.

Another popular homeopathic remedy for vertigo is *Bryonia alba*, although the evidence is scant. One scientific study referenced the key chemical, cucurbitacin R diglucoside, as a plant adaptogen, modulating the stress response.[34]

TRADITIONAL CHINESE MEDICINE

In traditional Chinese medicine (TCM), dizziness and vertigo are often caused by internal wind involving the liver, first described in the Yellow Emperor's *Classic of Internal Medicine*: "various types of wind disease [such as] dizziness belong to the Liver."[35] Liver wind usually develops from an underlying TCM pattern of either excess (liver-fire, liver-yang rising or turbid phlegm) or deficiency (kidney and liver-yin deficiency, kidney-essence deficiency or qi and blood deficiency).[36,37] A Chinese herbal formulation, Tian Ma Gou Teng Yin–*Gastrodia* and *Uncaria* decoction, is purported to be helpful to expel wind, extinguish internal wind, calm the liver-yang, invigorate the blood and tonify the liver and kidney.[38] It is composed of 11 herbs, including:

- *Gastrodia* rhizome
- stems of gambir vine
- *Uncaria* vine
- abalone shell
- jasmine fruit
- skullcap root
- Chinese motherwort
- *Eucommia* bark
- others

A usual recommended dose is between 5 and 7 pills daily, with results expected in 3 to 5 weeks. It is contraindicated for pregnant patients, and caution is advised in the setting of acute illness and in those with digestive disease.[39] Its mechanism of action may involve protein modulation, affecting neuroprotection and regeneration.[40]

Another cause of dizziness and vertigo is wind invasion, which enters the body through the ears, leading to accumulation of phlegm.[41] Two strategies to ameliorate this condition include protecting the ears against wind and reducing phlegm. The former may be as simple as covering up the ears on a windy day, and the latter can be accomplished through attention to diet. Highly refined and processed starches, sugar and sweets, alcohol, and greasy fried foods should be avoided because these promote phlegm. Examples of foods that are helpful in combating the ill effects of wind include:

- pine nuts
- basil
- chamomile tea
- celery
- flax oil

Acupuncture

Acupuncture has been used for patients with Menière disease and for relief of vertigo. An early report from 1983[42] evaluated a cohort of 34 patients with treatment-refractory Menière disease in a nonrandomized, unblinded study. Acupuncture afforded "great improvement" in their series, with the symptom of vertigo universally addressed. Bergamaschi and colleagues[43] looked at postural instability in elderly patients and whether laser acupuncture and auriculotherapy could provide benefit. In this small study, balance function as assessed on a force platform improved by 5% to 30% in

the short-term. The investigators hypothesized that the mechanism of action of acupuncture could be reduction of nociceptive interference with proprioceptive signaling, leading to improved postural control.

Taiwanese researchers performed a controlled, randomized study of acupuncture in stroke patients.[44] The Baihui acupoint (GV 20), found at the vertex of the head along the midline, as well as 4 associated points on the scalp, were chosen for acupuncture with manual stimulation, which was achieved through twisting of the needles until patients experienced sensations of soreness, numbness, swelling, or heaviness. A control group underwent needling alone without manual stimulation. Balance testing included the time taken for a patient to stand vertically from a seated position, the time taken for a patient to walk a distance of 6 m, and muscle strength of both lower extremities. Both groups experienced a decrease in the time for the twin tasks of rising to a seated position and walking 6 m; although only the group that received acupuncture with manual stimulation showed an increase in lower extremity muscle strength. The investigators concluded that acupuncture with stimulation may improve balance function in stroke patients.

Tai Chi

Tai chi has been studied as an aid to improving balance and is a form of exercise believed to originate from the thirteenth century Ming dynasty in China, influenced by Taoism philosophy. It focuses on breathing with slow, flowing movement, complete relaxation, and a serene mind: "Once you begin to move, the entire body must be light and limber. Each part of your body should be connected to each other part…The internal energy should be vibrated, like the beat of a drum. The spirit should be condensed in toward the center of your body."[45] A study published in 2012 followed a group of elderly Vietnamese individuals. One group was randomized to their usual daily activity, whereas the other performed 6 months of tai chi. The investigators studied 3 end points:

- the Falls Efficacy Scale
- the Pittsburgh Sleep Quality Index
- the Trail Making Test, which assesses cognitive function

The study found a significant improvement in the tai chi group for cognitive performance, sleep, and balance compared with the control group.[46] This report echoes an earlier systematic review that found that "Tai Chi has the potential to reduce falls or risk of falls among the elderly, provided that they are relatively young and non-frail…"[47] However, in a separate meta-analysis by Leung and colleagues,[48] although tai chi was recommended as an alternative treatment to reduce falls, it was not found to be necessarily superior to other interventions.

OSTEOPATHIC MANIPULATIVE THERAPY

Osteopathic manipulative therapy (OMT) has been described for disorders of dizziness and balance. OMT is taught in schools of osteopathic medicine and is also practiced by physical therapists and physiatrists. Its origin dates back to the late nineteenth century and a physician, Dr A.T. Still, who searched for a cure for diseases without using drugs. He developed a system to promote healing by manipulating bones, theoretically allowing free circulation of blood and balanced nerve function.[49] Techniques used are:

- counterstrain
- myofascial release

- cranial osteopathy
- muscle energy
- high-velocity low-amplitude therapies

A pilot study showed that OMT, with an emphasis on cranial manipulation, could benefit the postural stability of healthy, elderly individuals. The measurement of balance in this small nonrandomized sample of 40 patients was change in sway values.[50] Fraix[51] looked at the outpatient treatment of vertigo in a university setting using OMT. He found significant improvement of Dizziness Handicap Inventory scores in all 16 of his patients. This study reported that 3 patients (16.7%) experienced an exacerbation of their vertigo, and 5 (27.8%) experienced muscle soreness after the session. These adverse effects were rated as mild and did not last longer than 24 hours.

Eustachian tube dysfunction leading to dizziness and tinnitus may also be treated with OMT. A case report in the *Journal of the American Osteopathic Association*[52] details the modified Muncie technique: using a gloved finger, the physician palpates the pharyngeal orifice of the Eustachian tube in a pumping fashion, effecting a lysis of adhesions or myofascial release.

MIND-BODY APPROACHES

Mind-body approaches to dizziness have also been developed. Researchers in Northern California investigated the effectiveness of an interdisciplinary program comprising mindfulness, cognitive-behavioral techniques, and vestibular rehabilitation for patients with dizziness seen in an outpatient neurotology clinic.[53] The investigators discussed in detail their rationale for and approach to vestibular dysfunction and noted that anxiety is common in patients with disequilibrium, and moreover, dizziness was frequently associated with anxiety disorders. A shared neural circuit exists between the vestibular system and pathways for the emotional processing of anxiety. Patients' anxiety about their vestibular handicap may lead to avoidance of triggering behaviors, which then prolongs recovery. Chronic anxiety, therefore, may perpetuate vestibular dysfunction.

Cognitive-behavioral therapy (CBT), with its emphasis on challenging distorted thinking to change maladaptive behavior, has been recommended as an adjunct to vestibular rehabilitation. Dialectical behavior therapy (DBT), which incorporates mindfulness, has been helpful in difficult or treatment-resistant cases. It provides skills to help patients regulate their emotions, and mindfulness is a form of meditative awareness, a moment-to-moment focus on the here and now, stressing acceptance of each moment.[54] The investigators combined these modalities (CBT, DBT, and mindfulness) along with vestibular rehabilitation, in an effort to improve balance and address underlying autonomic arousal induced by a constant state of anxiety. Their interdisciplinary model examined the effects of a structured program using these services on:

- vestibular function
- mood
- coping
- health care use

A total of 129 patients were selected for the trial, and data were collected retrospectively. Patients attended an all-day panel, with visits to a physical therapist, neurologist, neuropsychologist, neuro-otologist, and audiologist, and had 5 group sessions over 10 weeks. The patients completed surveys including the Beck Depression Inventory, Beck Anxiety Inventory (BAI), SF-12v2 Mental Coping and Physical Coping Scales, Dizziness Handicap Inventory-short form, and Functional Level Scale

before and after treatment. The investigators reported that group treatment resulted in better mood, physical and mental health, functionality, and coping, and less impairment. Group treatment also decreased health care use for similar complaints in the 1-year period studied after the treatment protocol. Higher pretreatment rated depression, poorer mental or physical health, and a diagnosis of peripheral vestibulopathy were predictive of a better outcome in logistic regression analysis. Patients rated mindfulness, diaphragmatic breathing, and DBT as being more helpful than vestibular rehabilitation. Patients' self-reported anxiety as measured on the BAI also did not change.

SUMMARY

Balance problems are prevalent, especially among elderly individuals. A 2008 National Health Interview Survey of elderly Americans (older than 65 years, with a mean age of 74.4 years) found that approximately 1 in 5 elderly persons experience annual problems with dizziness or balance.[55] This finding included difficulty with unsteadiness (68.0%), walking on uneven surfaces (54.8%), and vertigo (30.1%). Women reported more problems than men. A significant number were disabled in terms of not being able to exercise (61.2%), drive (47.1%), or participate in social events (45.8%). Given the aging of the population, the importance of a thorough understanding of the complex balance system is paramount. Strategies for treatment necessarily encompass a broad range of beneficial modalities, as more research is accomplished and the lay public demands more choice, control, and effective solutions. Integrative techniques may be helpful, particularly for refractory cases.

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