Balance Disorders and Aging

By Sean G. Lennox, AuD, MSc, and Uta Stewart, MSc
sglennox@gmail.com; utastewart@hotmail.com

About the Authors

Sean Lennox is a graduate from UBC school of Audiology holding a master's of science in audiology, as well as a clinical doctorate of audiology from the University of Florida. He currently works in private practice in Ottawa, ON.

Uta Stewart is a graduate of Dalhousie University School of Human Communication Disorders holding a master's of science in audiology, as well as a clinical doctorate of audiology from Salus University. She currently works for the Saskatoon Health Region in Saskatoon, SK.

The trend in demographics that should lead to an overall concern for the health care systems of North America is the tremendous growth in the population of people over the age of 65 years. Konrad et al. reported that there would be almost 40 million adults over the age of 65 by 2010 in the United States alone.[1] Balance disorders and disorders that lead to instability become more prevalent with age.[2,3] The three sensory modalities responsible for normal balance and steadiness: vision, vestibular, and proprioception, can become compromised as a result of normal age related changes as well as age-related disease or pathology leading to increased risk of falls and fall related injury.[1,2,4,5]

The elderly fall more often and with greater consequence as a result of balance and instability issues, leading to huge personal costs as well as sky-rocketing health care costs.4 Over the age of 65, 1 in every 3 adults will suffer from a fall,[6] and given the explosion in the number people living today over 65 years of age, falls are a major healthcare crisis.[1] The US National Institutes of Health (Senior Health),[7] reported 1.6 million emergency room visits as a result of falls. The elderly are less likely to fully recover from a fall, and falls have been linked to increase the risk of death especially for individuals over 85.[5,7]

Authors have cautioned clinicians that gait and balance concerns should not be considered just a normal part of aging, as a large proportion of balance complaints occur in conjunction with some known disease process or a composition of different pathologies.[2,4] However, symmetric vestibular sensory hair cell loss, declining visual acuity, and declining muscular strength and mobility are some examples of known age-related changes to a human's balance system.[4] These normal age-related declines in function may cause worsening stability and sensory integration during locomotion.[3,6] Many musculoskeletal, cardiovascular, and neurologic disorders are associated with advancing age while also having detrimental effects on gait and balance.[2,6] Some common age related pathologies that affect balance, postural stability and gait include: arthritis, orthostatic hypotension, vitamin B-12 deficiency, diabetes mellitus, vestibular disorders such as benign paroxysmal positional vertigo (BPPV) and vertebrobasilar insufficiency.[1] Cardiovascular disease such as atherosclerosis which is highly associated with increased age has a degenerative effect on vision structures, inner ear structures, and the peripheral musculature and nerve tissues which encompass the balance system, and can lead to hemorrhaging and stroke in the brain.[1] Orthostatic hypotension has been cited as a major cause of falls in the elderly.[3,5] The patient typically reports severe lightheadedness and presyncope upon rising from lying or sitting down.[8] Causes of hypotension include cardiovascular disease, poly-pharmacy,

and dose related issues for medications to control hypertension.[2]

Arthritis, vitamin B-12 deficiency, and diabetes mellitus can lead to poor peripheral sensory control of limbs leading to poor gait and postural instability.[2] For arthritis, pain and inflammation of joints make quick movements needed to brace for falls more difficult and overall physical activity becomes difficult leading to physical muscular and skeletal attrition.[1] Joint pain has been cited as the most likely contributor to poor gait.[2]

Vitamin B-12 deficiency is a syndrome that forms as a result of a lack of essential vitamin B-12 absorption.[9] The deficiency of vitamin B-12 can cause significant degeneration of the peripheral and spinal nerves, causing poor postural stability and worsening gait because of poor tactile and proprioceptive sensitivity in the joints and extremities.[10]

Diabetes mellitus leads to sensory neuropathy for vision and peripheral sensory function in the extremities, leading to an increased risk for tripping over objects and loss of balance on moving, vibrating, or slippery surfaces.[1,2]

Benign paroxysmal positional vertigo (BPPV) is a vestibular impairment that is common as people age, and has been identified as another major cause of falls in the elderly.[1,5,6] The average age of onset for BPPV is between 51 and 57 years of age. BPPV is caused physiologically by misplaced otoconia in the semicircular canal (SCC), (commonly the posterior SCC) as a result of simple age related changes to the SCC, or head trauma.[5] The symptoms are usually precipitated by a change in head movement, so often people who have not been treated avoid that head movement or only sleep on a certain side in bed. The misplaced otoconia cause stimulation of the sensory structure of the SCC causing transient vertigo when the patient looks up, bends over, or turns in bed. This momentary vertigo can cause the patient to lose stability and fall. The dizziness/vertigo from this usually only lasts 30 seconds to a minute.

Vision is an essential sensory modality for balance as this sense allows a person to avoid obstacles and properly move around in space.[6] Physiologic deterioration to the eye and eye musculature, as well as vision disorders such as macular degeneration, cataracts, and glaucoma become more common with age, leading to poorer mobility, and identification of objects that could cause falls.6 Sturnieks et al., recommends the correction of visual deficits as part of falls prevention for the elderly.[6]

According to the American Academy of Audiology, an audiologist should be able to properly identify, assess, diagnose, manage, and help in the prevention of balance disorders for all patients. No other group will need these services more than those over 65 years.[8] The steps needed to prepare for this increased demand for balance services by the over 65 population include: improved diagnostic skills training, better inter-professional collaboration, proper and timely referral, improved falls prevention, and evidence based treatment strategies.

To increase proficiency in balance disorder and falls prevention diagnostics, university audiology programs will need to expand and improve balance disorders coursework and practicums to help future audiologists diagnose patients with balance complaints. As diagnostic protocols are developed for falls prevention clinics, audiologists will need to become active leaders in forming clinical test batteries. The next step is for Audiologists to become part of a team approach in diagnosing and treating balance disorders. Inter-professional communication and referral will need to be set-up between audiologists, ENT doctors, physiotherapists, neurologists, internal medicine physicians, and occupational therapists to provide the highest level of patient care in the falls clinic setting.[4,8]

Proper referral to other professionals will only be possible if audiologists become cognizant of the multitude of pathologies that may be associated with balance and dizziness symptoms which lead to falls, as well as normal age related changes to vision, muscular strength and mobility, and vestibular function.[2] An audiologist's caseload, even in a private practice hearing aid clinic, includes people predominantly over 65 years of age. As such, private practice "hearing focused" audiologists should have some idea of when a diagnostic balance assessment is necessary, and when there is a risk of falling present, so proper referral to a falls clinic can be made. Prevention of future falls as a result of balance disorders should be a high priority to all audiologists.[4,8] This means that any patient at risk for a fall based on balance disorder complaints, or patients who have reported a fall in the past should be referred to a falls prevention program and have a home safety assessment.[4,8]

In some circumstances, audiologists may also be needed to conduct vestibular rehabilitation therapies (VRT) or be able to recommend exercises to do at home. Audiologists can be involved in coordinating home-based VRT, group VRT, and simple exercise programs which have been shown to be effective for the elderly.[1,5,6] Canalith repositioning maneuvers are also within the scope of practice for audiologists for patients with BPPV.[2]

CASE STUDY BILATERAL WEAKNESS

- 81-year-old female (A.D.).
- Referred by the Cochlear Implant (CI) Team as part of the assessment for CI.
- History of vertigo in the past where episodes would last from minutes to hours.
- Two years prior to assessment the patient had sudden episode of vertigo and a force which was "trying to get her down" which lasted for about one minute.
- She also experienced fleeting episodes where she felt like she was "moving inside her head," even when stationary.
- Following this she had poor balance and would have to hold on to something when walking; was unable to walk in a straight line.
- This resolved after a few months and she was able to walk without holding on to things.
- Reports oscillopsia when trying to read a sign while walking or driving.
- Visual motion around her is bothersome and makes her feel off balance.
- She has difficulty walking in the dark in poor lighting.
- She was investigated for stroke which was negative.
- Severe flat sensorineural loss in the right ear and severe to profound loss in the left ear

CALORIC RESULTS

- No nystagmus response was noted for either cool or warm water irrigation.
- Results suggest bilateral peripheral disorder.

RECOMMENDATIONS

- Referral to falls prevention program.
- Vestibular rehabilitation therapy.

REFERENCES

1. Konrad, Girardi, and Helfert. Balance and aging. Laryngoscope 1999;109:1454–60.
2. Salzman. Gait and balance disorders in older adults. Am Fam Phy 2010;82(1):61–68.
3. Sloane and Baloh. The vestibular system in the elderly: clinical implications. Am J Otolaryngol 1989;10:422–29.
4. Alvord. Falls assessment and prevention. San Deigo: Plural Publishing; 2008.
5. Cronin and Steenerson. Disequilibrium of aging: response to a 3-month program of vestibular therapy. Phy Occupat Ther Geriat 2011;29(2):148–55.
6. Sturnieks DL, St George R, Lord SR. Balance disorders in the elderly. Neurophysiol Clin 2008;38:467–78.
7. US National Institutes of Health. Falls and older adults. 2011; Retrieved July 6th, 2012, from http://nihseniorhealth.gov/falls/aboutfalls/01.html.
8. Jacobson and McCaslin. Assessment of falls risk in the elderly. In Jacobson & Shepard (Eds.). Balance function assessment and management. San Diego: Plural Publishing; 2008
9. Stabler, Lindenbaum, and Allen. Vitamin B-12 deficiency in the elderly: current dilemas. Am J Clin Nutrit 1997;66:741–49.
10. Oh DL, and Brown. Vitamin B12 deficiency, Am Fam Phys 2003;67:979–86.

Editor's note: For those who are interested in becoming involved in a new CAA interest group on vestibular issues, please contact either Maxine Armstrong (Maxime.Armstrong@uhn.ca) or Janine Verge (Janine.Verge@cdha.nshealth.ca).

Canadian Hearing Report 2013;8(5):32-34.