The balance system has two main jobs. One is to stabilize our vision so that we can examine something with our 3D visual system. The other is to stabilize the body and help to keep us ready to react quickly and, for example, stay upright when standing on a bus that comes to a sudden stop.

**Why are tests done?**

Balance tests assess whether or not there are problems with the balance structures of the inner ear — see diagram below. These complex structures sit beside the hearing structures of the inner ear (cochlea).

The balance system consists of five sensors in each ear — three fluid-filled semicircular canals and two otoliths (utricle and saccule). We have the ability to measure all ten of these sensors.

**Hearing tests**

Not all vestibular disorders affect the hearing portion of the ear. In addition to a traditional hearing test, however, patients with complaints of dizziness or imbalance often undergo more detailed hearing tests. These include: a pressure test to check eardrum movement; testing how the eardrum reacts to loud noises; and, checking for small echoes coming from the inner ear in response to a sound.

The resulting test patterns can potentially reveal problems with the balance system. A normal hearing test is in itself informative.

**Tests that involve muscles**

Although we understand them poorly, there are two pathways that go from certain structures of the balance system to different muscle sets. These pathways evoke responses in different muscle sets. They can be tested with two different tests:

**cVEMP test**

The first test that involves muscles, the cVEMP (Cervical Vestibular Evoked Myogenic Potential) test, uses the muscles in the neck to record a response from one of the balance system structures called the saccule.

Sensors are attached to the forehead, collarbone and on either side of the neck. Loud sounds played through earphones activate the saccule as the patient contracts the neck muscle on one side, then the other.

A properly functioning saccule will evoke a response. No response on one side or on both sides is abnormal; an asymmetrical response (one side different from the other) also suggests that there is something wrong.

One other part of the cVEMP test lowers the sound volume to a level where there should not be a response (it should disappear due to the thickness of the skull protecting the saccule). However, if there is a thinning of the bone (called a dehiscence), these lower volume sounds will evoke a response — this is abnormal.

cVEMP testing can take anywhere from 15 to 30 minutes in most centres. Occasionally it can cause a slight sensation of brief dizziness.

**oVEMP test**

The second test that involves muscles is the oVEMP (Ocular Vestibular Evoked Myogenic Potential) test. It engages the little eye muscles around and under each eye. Sensors are attached to the collarbone, sides of the nose and under each eye.

At some testing centres a sound is played in the ear. In other
centres a “mini-shaker” is used at the top of the forehead; it activates the utricle by strongly tapping the forehead.

The response on both sides is again measured. No response on one or both sides, or an asymmetrical response, indicates a problem with the utricle.

The oVEMP test can also help detect a bony dehiscence.

The test takes about 5 to 10 minutes and may cause temporary dizziness or an unsteady feeling while the tapping is occurring.

**Balance-performance test**

The GANS Sensory Organizational Performance (SOP) test and Computerized Dynamic Posturography (CDP) are different ways of assessing overall patterns of balance performance under different conditions. Some centres use the GANS SOP test and others use CDP.

Although no test of balance performance can provide a specific diagnosis, there are definitely well established patterns of functional impairment that indicate a relationship with other vestibular tests.

**vHIT test**

As mentioned above, one of the jobs of the balance system is to stabilize the eyes; this vestibular-ocular reflex (VOR) allows us to keep our gaze stable while moving our head. The vHIT (Video Head Impulse Test) assesses how the VOR is functioning.

Patients put on special goggles that record eye movements when the head is moved quickly. People with neck problems may not be able to do all or parts of this test. The vHIT test assesses all six semicircular canals. Most people do not get dizzy or nauseous with this test.

**VNG tests**

VNG (Videonystagmography) tests involve wearing goggles fitted with infrared cameras that record eye movements. VNG tests may reveal nystagmus, an abnormal involuntary repetitive “jumping” movement of the eyes - this is an indirect indicator of vestibular malfunction.

**Oculomotor tests**

There are several tests that evaluate eye movements. These oculomotor tests assess the brain’s ability to make voluntary eye movements. Abnormal results can indicate problems in the brain stem and/or cerebellum (part of the brain at the back of the skull). These tests do not cause dizziness for most people.

**Positioning and positional VNG tests**

These tests assess the six semicircular canals, as well as look for possible problems in the central nervous system. They are done in a variety of positions, including those that are known to provoke vertigo (spinning sensation) for a patient.

Positioning VNG tests are helpful in detecting a fairly common disorder known as BPPV (Benign Paroxysmal Positional Vertigo). If a patient has BPPV, the test can cause a brief episode of dizziness; this can be very helpful in diagnosing this disorder.

**Caloric test**

Also known as the “water test”, this test assesses the lateral (horizontal) canals and corresponding nerve pathways. The left and the right ear are tested one at a time by putting warm or cool water in the ear for 30 seconds while the patient wears special goggles. Some pressure may be felt in the ear canal.

The temperature of the water transfers to a part of the vestibular system and warms it up or cools it down in comparison to body temperature. This temporarily tricks the vestibular system and often induces brief dizziness.

The caloric test is done at least once in each ear with warm water. Depending on the results, testing with cool water may follow. Very rarely ice water is used to determine if there is any function at all left in that part of the vestibular system.

It is very helpful both for the patient and also for the assessing clinician to compare the dizziness caused by the water test with the dizziness that the patient is suffering from.

**How can I get tested?**

Testing is offered at several locations in British Columbia. A referral from a specialist is required to book an appointment. See our Society’s Health Professional’s Who Can Help Your Deal with Balance and Dizziness Disorders brochure for more information.

**Do you have questions?**

Take a few minutes to write your questions for the next time you see your health-care provider.

**My questions:**