

VERTIGO

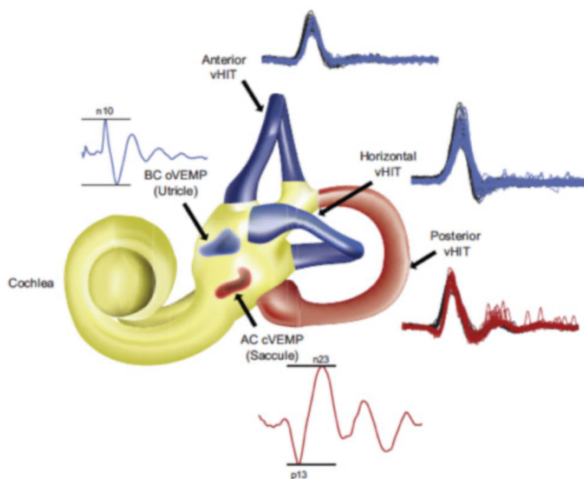
WHAT IS VERTIGO?

Vertigo is a **hallucination of movement** that is caused by a left-right difference between the inner ear balance organs or their connections. “Vertigo” is not a diagnosis. It is only a term used to describe dizziness associated with a sensation of self motion or movement of the environment. Vertigo is merely a symptom just like “headache” or “chest pain”.

There are many different causes of vertigo. It is not always easy to describe the sensation experienced, which might be a spinning, rocking, tilting or dropping sensation. Sometimes it can be difficult to separate vertigo from sensations like light headedness, disorientation or brain fog. Sometimes, the cause of vertigo is evident in the history of its presentation alone. The physical examination and vestibular testing can also help determine the cause of vertigo. Examination during an attack of vertigo also provides valuable information, therefore **our clinic focuses on seeing our patients as close as possible to an attack.**

VESTIBULAR FUNCTION TESTING

Each inner ear balance organ has five end organs: the three semicircular canals (anterior, posterior and horizontal canals) which sense rotation or “angular acceleration” and two gravity sensors (utricle and saccule) that sense “linear acceleration” including gravity. It is now possible to test all five end organs. Here are some tests we commonly use in clinic.



- **Video Head Impulse Test (vHIT)**

Our inner ear balance organs stabilise the visible world upon the retina as we move our heads during walking and running. This is achieved by the vestibulocular reflex, by means of powerful connections between the balance organs and the extraocular muscles which move the eye. The vHIT tests your ability to match rapid head movements with equal and opposite eye movements.

Method

You will be asked to sit upright and wear a pair of lightweight video-glasses. You will focus upon a fixed target. The examiner (an audiologist or doctor) will deliver 20 head turns in the direction of each semicircular canal. The speed of eye movement is measured and expressed as a fraction of the speed of head movement. This test is a valuable screening test of semicircular canal function.

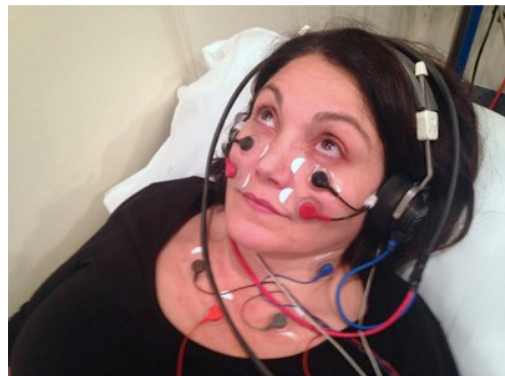
Preparation

Do not wear mascara or eye-liner since these interfere with pupil tracking.

Time taken: 10 minutes

- **Vestibular Evoked Myogenic Potentials (VEMP)**

The gravity sensors of our inner ear balance organs have retained their primitive ability to be activated by sound and vibration. The VEMP test exploits this sound and vibration sensitivity to assess the integrity of our gravity sensors.



Method

Surface electrodes (like ECG dots) will be applied to the skin directly underlying your lower eyelids and over your neck muscles. You may be asked to look upwards or to elevate your head 45 degrees above horizontal. You will be asked to listen to clicking noises through headphones. Alternately, vibration pulses will be delivered over your forehead at 3 pulses per second. The recordings taken from your neck muscles or eye muscles give us useful information about your gravity sensors.

Preparation: None

Time taken: 10 minutes

- **The Bithermal Caloric Test**

While lying semi recumbent on a bed, dark goggles will be placed on your eyes and a small infrared camera records your eye movements. The test involves irrigating the external ear canal with warm and cool water for 40 seconds; you will experience a sensation of tilting or turning as your balance organs are stimulated by the water. You may also notice your eyes flicking in response to the stimulus (nystagmus). The velocity of these eye movements is recorded and compared for left and right ear stimulation. It is important to keep your eyes open and to remain alert during the test. The nurses who perform the test are highly skilled and will ensure that you feel safe and comfortable during the test. They may also engage you in conversation to ensure you stay awake.

Preparation

You will need see your general practitioner one week before the test to ensure there is no wax in your ears, and you must not eat or drink for 4 hours before the test. Diabetic patients could request an early morning (8.30 AM) appointment, take their regular hypoglycaemic tablets before the test and ensure they have breakfast when the test is completed. Patients on Insulin should delay the morning insulin dose until just before breakfast. If you are given a later appointment, you could eat an early (~5AM) breakfast and take your insulin/tablets before breakfast. Medications specifically taken to quell an attack of vertigo such as prochlorperazine ("stemetil") or Cinnarizine ("stugeron") should be withheld for 48 hours before the test. If you are a long term user of sedatives, please speak to your doctor to check if these can be withdrawn. All other medications including migraine prevention drugs, pain killers and cardiac medications should be taken with a sip of water, on-time as prescribed.

Time taken: 30-60 minutes

- **Auditory Brainstem Response (ABR)**

This is an extension of the standard hearing test, and further measures the auditory nerve from the ear (cochlea organ) to the brain. It is a relatively simple and non-invasive test.

Method

The audiologist will first cleanse the skin on the forehead and ears and will place very small recordings cups onto the head and earlobes with gel. Then the patient lies comfortably on a bed with their eyes closed, in a darkened room, as clicking sounds are played for about 5 minutes into each ear separately. The recording cups measure brain activity which help to determine how the brain is hearing and processing the sounds, and so there is no response needed from the patient.

Preparation: None

Time taken: **Approximately 30 minutes**

- **Bias Testing (Subjective Visual Horizontal Test)**

This test measures a person's ability to determine what is 'level', and is a test of our gravity-sensing balance organs (the otolith organs) and how they work with our eyes.

Method

In this test, the patient sits in a darkened room where a small bar of light sits in front of them. The light bar is then tilted to different degrees off-centre, and the patient must use a handheld remote control to tilt the bar of light back to what they feel is perfectly flat to the horizon. The test is repeated 10 times for each eye separately.

Preparation: None

Time taken: **Approximately 10 minutes**

- **Rotational Chair Test**

This test is an additional measure of lateral semicircular canal function and uses our vestibulo-ocular reflex (VOR). It is also used to assess VOR suppression (by bright light) in central vestibular / cerebellar disorders.

Method

The patient sits on a chair and is fitted with dark goggles with a small camera to record eye movements as they are slowly turned in the motorised chair.

Preparation

You must not eat or drink for 3 hours before the test. Diabetic patients should request a morning appointment and take their regular hypoglycaemic tablets before the test and ensure they have breakfast when the test is completed. Patients on Insulin should delay the morning dose until just before breakfast. Medications specifically taken to quell an attack of vertigo such as prochlorperazine ("stemetil") should be withheld for 48 hours before the test. If you are a long term user of sedatives, please speak to your doctor to check if these can be withdrawn. All other medications including migraine prevention drugs and cardiac medications should be taken with a sip of water, on-time as prescribed.

Time taken: Approximately 15 minutes

- **Audiometry (Hearing Test)**

Your hearing threshold provides valuable clues to the origins of vertigo. A hearing test is therefore an essential component of balance testing. Screening audiometry takes only 20 minutes. Audiometry with impedance and speech testing takes 40 minutes.

Preparation

Your ears will need to be clear of wax

Time taken: 20 minutes for screening

Time taken: 40 minutes with impedance and speech testing

- **Trans Tympanic Electrocochleography**

This test measures the distortion of inner ear membranes (linings) caused by the presence of excess inner ear fluid. It is useful in the diagnosis of Meniere's Disease and related disorders.

The test is performed by an expert otolaryngologist and involves placing a thin wire (electrode) through a small piercing that is made in a safe place on the ear drum. The ear drum is anaesthetised beforehand. During the test, noises (clicks or tones of specific frequencies) are presented through headphones.

After the test, patients are advised to keep the ear dry for one week.

- **Home Video Goggles**

It is often challenging to see us when you are acutely dizzy. When you are dizzy, however, your eyes will generate movements called nystagmus that help us diagnose vestibular disorders with greater accuracy. Our clinic offers custom-made miniature take-home video goggles that will enable you to record your eye movements whilst acutely dizzy at home. You will receive training on how to use these during your appointment.

Preparation

Ensure you are in a safe environment and have a support person with you prior to putting on the goggles as you will be unable to see with them on.

Time taken: 5 minutes



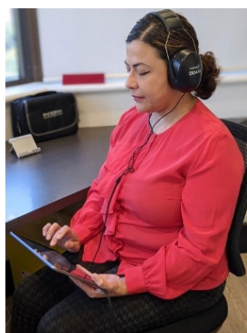
- **Home Audiometry**

Some vestibular disorders are associated with changes in hearing. To help capture this, we offer portable iPad audiometer kits for loan, so that you can measure your own hearing at home. You will be trained on how to use this equipment during your appointment.

Preparation

You will need to find a quiet place to conduct the hearing test

Time taken: 20 minutes



Tests for Specific Balance Disorders

- **Rotundum Positioning Chair**

The Rotundum Positioning Chair is a mechanical chair that enables treatment of benign positional vertigo under video guidance. While more than 90% of BPV is treatable at the bedside, the Rotundum is useful when BPV affects more than one semicircular canal or is difficult to treat at the bedside due to a limited range of neck movement, physical disability or where an unusual eye-movement (atypical positional nystagmus) is observed. The test is performed after a 3 hour fast

Pre-medication with anti-nauseants (prochlorperazine, ondansetron) is recommended for patients with motion sensitivity.

The test itself takes 5-10 minutes. Preparation and explanation take 10 minutes.



- **Vestibulospinal Reflex Testing**

A majority of balance function tests examine the pathways from the inner ear balance organs to the eyes (vestibulo ocular reflexes).

Vestibulospinal reflex tests assess balance pathways to the trunk and limbs. These tests use a low intensity vibration pulse or electrical pulse to activate the balance organs and record the resultant muscle response (using electromyography or EMG) and whole body displacement (using a force platform or 3D motion capture system).

These tests are still used chiefly in research but hold promise as methods of assessing imbalance and gait disturbance.



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The test is performed by an expert otolaryngologist and involves placing a thin wire (electrode) through a small piercing that is made in a safe place on the ear drum. The ear drum is anaesthetised beforehand. During the test, noises (clicks or tones of specific frequencies) are presented through headphones.

After the test, patients are advised to keep the ear dry for one week.

VESTIBULAR REHABILITATION

Virtual Reality Based Vestibular Rehabilitation

Our clinic offers virtual reality based vestibular rehabilitation for patients with inner ear balance loss affecting one ear (eg: vestibular schwannoma or vestibular neuritis) or both ears (bilateral vestibular loss).

This involves the use of Virtual Reality Glasses and participating in games designed to challenge your balance system. Each game takes around 15 minutes.

During your initial appointment, you will receive training on the use of the VR equipment. This equipment will then be loaned to you for 6 weeks, during which time you will be asked to undertake two sessions of rehabilitation training daily.



COMMON VESTIBULAR DISORDERS

- Benign Positional Vertigo (BPV)
- Vestibular Migraine
- Ménière's Disease
- Vestibular Neuritis
- Vestibular Schwannoma
- Superior Semicircular Canal Dehiscence
- Vestibular Paroxysmia
- Psychophysical Vertigo

See:

https://www.balanceclinic.com.au/common-vestibular-disorders.html#stacks_in_4471199_collapse

VIDEO SIMULATIONS

- Left Posterior Canal BPV
- Epley Manoeuvre
- Left Anterior Canal BPV
- Right Horizontal Canal BPV
- Nystagmus: The Effect of Visual Fixation
- Cerebellar Nystagmus
- Left Peripheral Vestibulopathy
- Ménière's Disease
- Vestibular Migraine

See:

<https://www.balanceclinic.com.au/video-simulations.html>

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