

## **Vestibular Function Testing**

### **Tests commonly used in the clinic:**

1. Video Head Impulse Test (VHIT)
2. Vestibular Evoked Myogenic Potentials (VEMP)
3. Bithermal Caloric Test
4. Auditory Brainstem Response (ABR)
5. Rotational Chair Test
6. Audiometry (Hearing Test)
7. Electrocochleography (ECochG)

### **1. 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

### **2. 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

## **3. 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

## **4. 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

**5. 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

**6. 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

## 7. 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.

<https://www.balanceclinic.com.au/vestibular-function-testing.html>

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