

Vestibular Evaluation Protocol

Ear & Hearing | Center for Neurosciences

Patient must have comprehensive audiologic evaluation completed in the last 60 days prior to vestibular evaluation. Typically, the audiologic evaluation is completed on the same day, prior to the vestibular evaluation. Within our clinical context, the goal of a vestibular evaluation is to either rule out or confirm an inner ear etiology of vertigo, dizziness, or imbalance.

COMPREHENSIVE AUDIOLOGIC EVALUATION

30 MINS

Otoscopy
Tympanometry
Acoustic Reflexes
Pure-tone thresholds for air and bone conduction, 125-8000 Hz
Speech reception thresholds
Word recognition scores at UCL-5dB HL using CNC recorded word lists

VESTIBULAR EVALUATION

90 MINS

The vestibular evaluation is comprised of the following parts:

Videonystagmography

1. Ocular motor evaluation
2. Positional/Positioning evaluation
3. Bithermal air caloric evaluation

Electrophysiologic test

4. Cervical Vestibular Evoked Myogenic Potential (cVEMP)

Cervical Vestibular Evoked Myogenic Potential (cVEMP)

cVEMP is an electrophysiologic test used to determine the function of the saccule and inferior vestibular nerve. Responses are measured from the sternocleidomastoid muscle in the neck. The patient is seated in an upright position and instructed to quickly turn their head opposite to the ear of stimulation in order to engage the sternocleidomastoid muscle upon hearing the 500 Hz toneburst stimuli. Recording is performed with a minimum of 40 and maximum of 120 sweeps.

cVEMP thresholds are obtained via the following method of presentation levels to the right and left ears individually:

| Presentation level | Response | Next presentation level | Response | Next Step |
|--------------------|----------|-------------------------|----------|--|
| 100 dB | Present | 70 dB | Absent | Increase by 10 dB until response is obtained – to confirm threshold |
| 100 dB | Absent | Repeat 100 dB | Absent | Testing Complete – no response obtained |
| 100 dB | Present | 70 dB | Present | Decrease by 5dB until no response is obtained – to confirm threshold |

**All responses are replicated to confirm findings*

Videonystagmography (VNG)

VNG is used to evaluate patients with dizziness, vertigo, or balance dysfunction. In this test, eye movements are recorded which gives information about the central and peripheral balance system via the vestibular ocular reflex. It provides an objective assessment of the oculomotor and vestibular systems. VNG testing consists of three parts:

- 1) Oculomotor evaluation
- 2) Positioning/positional evaluation
- 3) Caloric stimulation of the vestibular system

Ocular Motor Evaluation

The Ocular Motor Evaluation is the first part of the VNG test battery and is performed in order to identify potential underlying ocular motor disorders or central issues that may impact the rest of the test. The following tests are performed during the ocular motor evaluation:

- 1) Gaze
- 2) Smooth pursuit
- 3) Random saccades
- 4) Optokinetic right and left

Positioning Evaluation

The positioning evaluation involves movement of the patient from one position to another in order to test the semicircular canals for benign positional paroxysmal vertigo (BPPV), including:

- 1) Dix-Hallpike right
- 2) Dix-Hallpike left

Positional Evaluation

The positional evaluation is performed to determine if nystagmus is generated due to the gravitational orientation of the vestibular system in the following stationary positions:

- 1) Supine
- 2) Head right - If abnormal - body right is performed
- 3) Head left - If abnormal - body left is performed

Bi-thermal Air Caloric Evaluation

The bi-thermal air caloric evaluation is performed to determine the function of the horizontal semicircular canals in each ear separately. This allows us to determine if there is symmetry in the vestibular system, or if there is a unilateral weakness. The patient is put in supine position and the chair back is raised to a 30 degree angle, with vision denied. Air caloric evaluation involves stimulation of the vestibular system via warm and cool air presented to the ear canals continuously for 60 seconds, followed by tracking eye movements for 60 seconds. Our protocol is as follows:

- 1) Right ear – warm air stimulation
- 2) Left ear – warm air stimulation
- 3) Left ear – cool air stimulation
- 4) Right ear – cool air stimulation

Interpretation of test battery:

Normal

If the ocular motor, positional/positioning, bithermal caloric, and cVEMP evaluations are within normal limits suggesting that the inner ear is not a contributing factor to the balance complaint, it will be recommended that the patient follow-up with their referring provider.

Abnormal central findings

If the ocular motor evaluation is found to be abnormal, this is suggestive of a central component to the balance complaint. Follow-up with managing neurologist or referral will be recommended.

Abnormal positional/positioning findings

If the positional/positioning evaluation is found to be abnormal, patient will be referred for treatment and management. Referral is based upon specific findings.

Abnormal peripheral findings

Abnormal peripheral findings typically consist of unilateral caloric weakness or bilateral hypofunction. Should abnormal peripheral findings be identified, the patient will be referred for otologic evaluation.

A unilateral weakness is calculated by comparison of caloric responses between right and left ears.

- A unilateral weakness of 25% or more is considered a significant asymmetry, whereas 20-25% is considered borderline (Myers, 2011).

Bilateral hypofunction is considered present if:

- The total response of all four conditions (right warm, left warm, right cool, left cool) is less than 22 deg/sec (Jacobson & Newman, 1993), or
- The total sum of the right ear response is less than 12 deg/sec **and** the total sum of the left ear response is less than 12 deg/sec (Barin, 2008).

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