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Simultaneous ocular and cervical VEMP

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Protocol status: Working
We use this protocol and it's working

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Abstract

Vestibular Evoked Myogenic Potential (VEMP) evaluates the integration of the vestibular nerves with the brainstem and the muscular system. It tests the peripheral and central vestibular pathway and has been used to test brainstem functions and postural reflexes. VEMP tests the vestibulospinal and vestibulo-ocular reflexes involved in the control of the postural balance. Normal VEMP depends on the functional integrity of the saccular and utricular maculae, the inferior vestibular nerve, the superior vestibular nerve, the vestibular nuclei, the central vestibular pathways, and the neuromuscular plaques involved in these reflexes. This test presents characteristics favorable to its use in clinical practice: objectivity, non-invasiveness, easy execution, low cost, rapidity, and minimal discomfort for the patient.This protocol aims at showing how to perform Simultaneous ocular and cervical VEMP.

Equipment / Software

1 This protocol uses the Labat® equipment, two channels, connected to a laptop. (Figure 1 and 2).

Figure 1. The laptop connected to Labat® equipment

Figure 2. Tracing of ocular and cervical VEMP using Labat® equipment

Position of electrodes

2 In the recording of cervical VEMP and ocular VEMP performed simultaneously, channel 1 electrodes are used to record ocular VEMP and channel 2 electrodes to record cervical VEMP. The active electrode related to cervical VEMP is placed on the opposite side at the anterior border of the sternocleidomastoid muscle in its upper third, and the reference electrode is placed in the sternal notch region. For ocular VEMP recording, the active electrode (negative electrode) in channel 1 is placed approximately 1 centimeter (cm) below the lower eyelid, and the reference electrode (positive electrode) is placed at a distance of approximately 1 cm from the active electrode. The ground electrode is placed on the forehead (Figure 3).

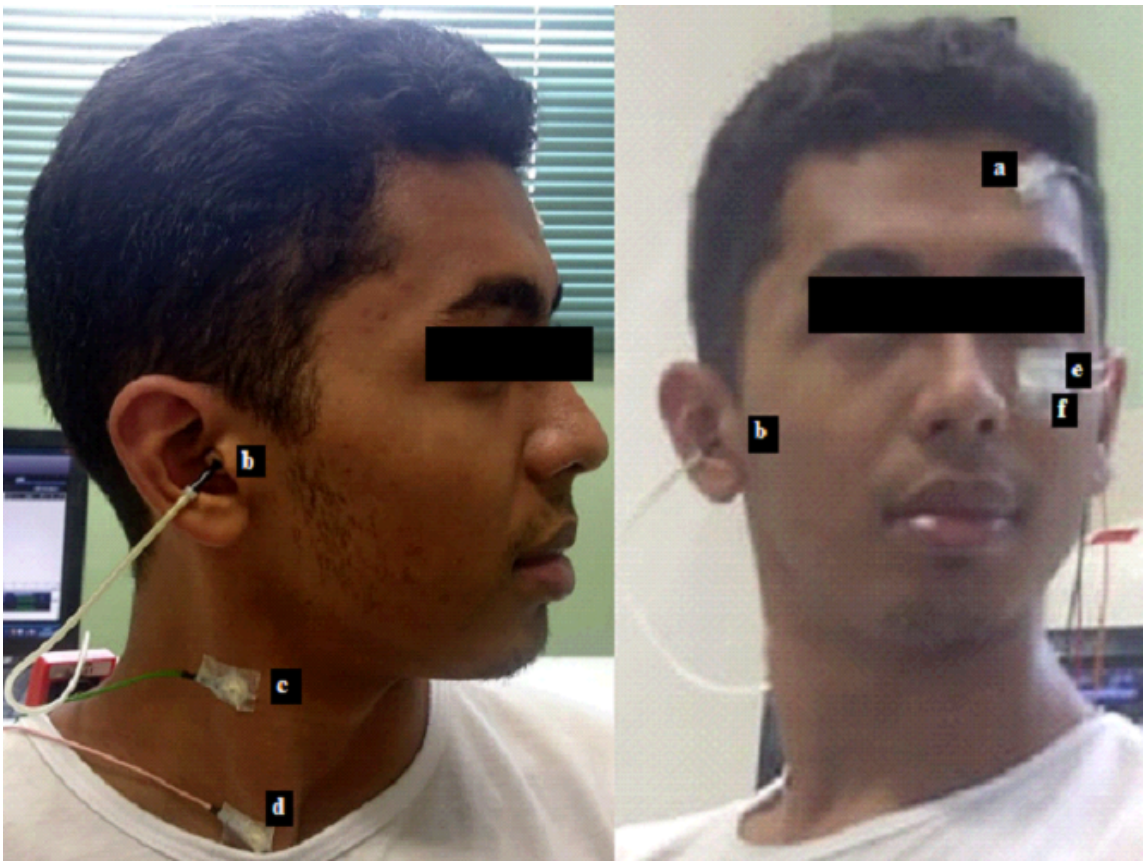

Figure 3. Positioning of the electrodes for simultaneous cervical and ocular VEMP. a) ground electrode. b) auditory stimulus. c) active electrode on channel 2 at the anterior border of the sternocleidomastoid muscle in its upper third. d) reference electrode on channel 2 at the sternal notch region. e) active electrode on channel 1 below the lower eyelid. f) reference electrode on channel 1 below the active electrode

Position for the exam

3 Participants are instructed to sit on the chair and keep their heads rotated to the opposite side of the stimulated ear, causing contraction of the sternocleidomastoid muscle. At the same time, the participant is instructed to look at a stationary target located on the wall in front of him and then immediately at a fixed point located above the target, in a vertical viewing angle of approximately 30º above the horizontal plane (Figure 4 and 5).

Figure 4. The figure shows the sitting position of the person examined and the rotation of the head to the opposite side of the stimulated ear

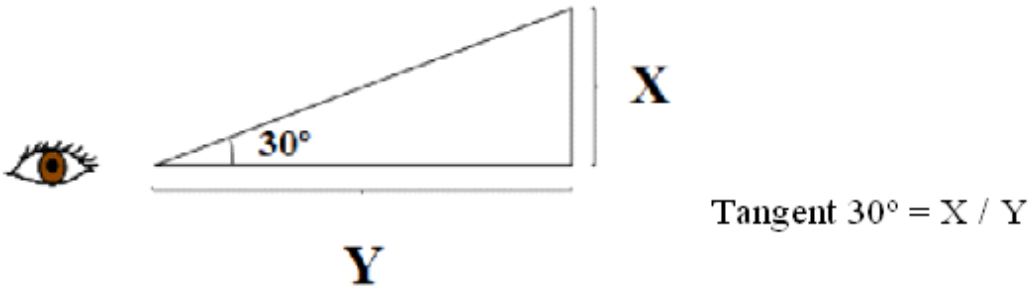

Figure 5. Trigonometric ratio used for the contraction of extraocular muscles

Data of acquisition

4 The stimuli are presented through ER 3A insertion phones, with disposable foam eartips. Tone burst stimuli at an intensity of 120 decibels normalized hearing level (dB nHL) are used. A bandpass filter must be used from 10 Hz to 1500 Hz. To obtain each record, 100 stimuli are presented at a frequency of 500 Hz at a rate of four stimuli per second.. The scan window should be 50 milliseconds (ms). Each subject is subjected at least two stimulation per side to verify replication of the potential. The impedance values, which had to be below 5 kiloohm (KΩ), are checked before each record.

Reading the data

5 The ocular VEMP is composed of two sets of biphasic waveforms. The first biphasic potential has a negative peak (N) with an average latency of 10 ms, followed by a positive peak (P) with an average latency of 15 ms, which is known as N10–P15. The cervical VEMP consists of two sets of biphasic waveforms. The first biphasic potential has a positive peak (P) with an average latency of 13 milliseconds (ms), followed by a negative peak (N) with an average latency of 23 ms, which it known as P13–N23 (Figure 6 and 7).

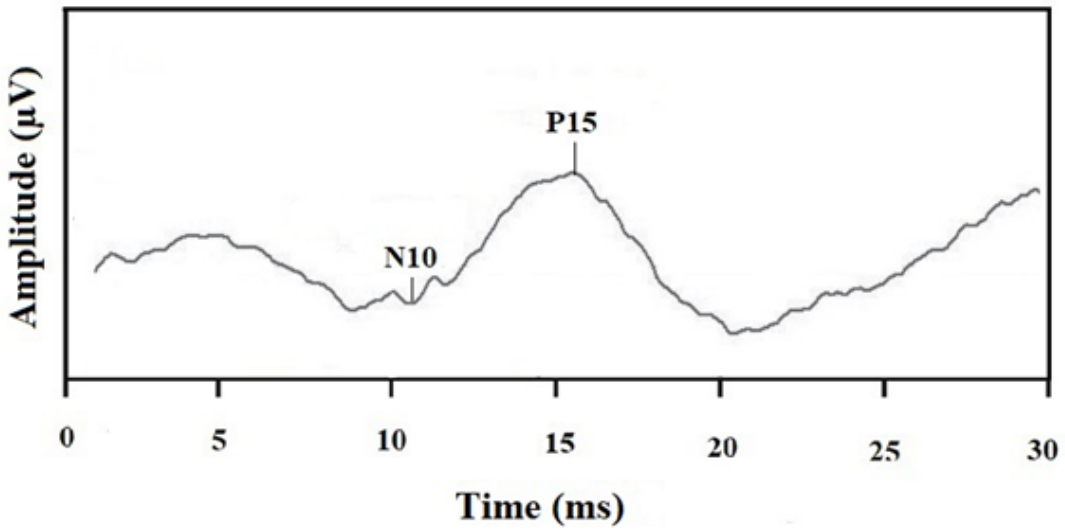

Figure 6. Ocular VEMP

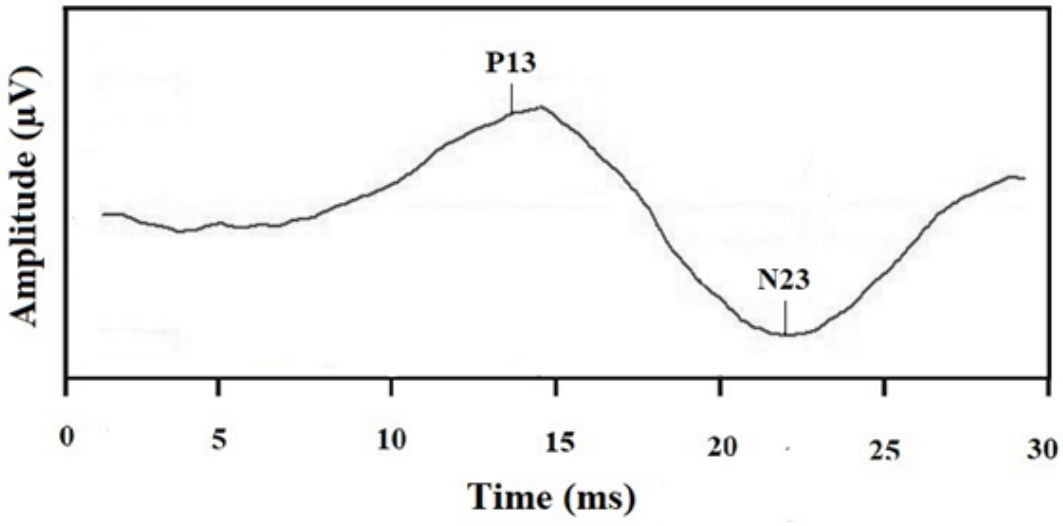

Figure 7. Cervical VEMP