THE VESTIBOLLO-COLLIC REFLEX (VCR) – SHORT PRESENTATION OF THE TECHNIQUE

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ABSTRACT

The vestibullo-collic reflex (VCR) or Vestibular Evoked Myogenic Potential (VEMP) is a new non-invasive method for assessment of vestibular function. VEMP are recorded over ipsilateral sternocleidomastoidian muscle tonically contracted during monoaural intense clicks deliver via headphones (Colebatch method). VEMPs are useful diagnostic test in a variety of peripheral and central vestibulopathies.

Key words: vestibullo-collic reflex (VCR), Vestibular Evoked Myogenic Potential (VEMP), vestibulopathies, migraine

VEMP DEFINITION

The vestibullo-collic reflex (VCR), also called Vestibular Evoked Myogenic Potential (VEMP) is a new non-invasive method for assessment of vestibular function.

VEMP is a short-latency reflex recorded from averaged sternocleidomastid electromyography in response to intense auditory clicks delivered via headphones (1, 2).

VEMP is otolith-mediated. The otolith organs provide information for the control of posture and ocular stability. VEMP is a technique based on residual acoustic sensitivity of the sacculus, which during the course of its evolution functioned as a hearing organ. VEMP are recorded over ipsilateral sternocleidomastoidian muscle tonically contracted during monoaural intense clicks deliver via headphones (Colebatch method).

The initial response evaluate otolith function and consist of an initial positivity (p13) followed by a negativity (n23) and is followed by later components (n34, p44) of probable cholear origin (1, 2).

VEMP is a oligosynaptic reflex: beginning in the saccular macula, via the inferior vestibular nerve, lateral vestibular nucleus, and medial vestibulospinal tract, and finally terminating at the accesory nucleus – the motor neurons of the sternocleidomastoid muscle (1, 2).

VEMP TECHNIQUE

The patients are seated in an armchair with adjustable backrest in a semireclining position at an angle of 45º to the orizontal plane. They were asked to turn their head to one side by about 80º in order to activate the contralateral sternocleidomastoid muscle (SCM).

The surface EMG activity is recorded from electrodes placed over the upper half of each SCM, with a reference electrode on the medial portion of the clavicle and groud electrod over the sternum. CED™ 1902 preamplifiers (Cambrige Electronic Design, Cambrige, UK) are used at Headache Research Unit, Department of Neurology, University of Liege, Belgium.

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The VCR amplitude scales in proportion to tonic EMG activity. Because the patient has to maintain a constant tonic contraction of the muscle during VCR recording, an oscilloscope screen is placed in front of him which display the EMG. Visual feedback ensure a constant muscle activity of 30-40 μV, which is considered optimal target EMG level to elicit the VCR.

A number of 225 (3 blocks of 75) brief clicks (0,1 ms), at a repetition rate of 3 per second and a fixed intensity of 95 dB normal hearing level are delivered via earphones to the ipsilateral ear to the contracted SCM muscle.

Rectified and unrectified EMG activity is collected 50 ms before to 50 ms after the stimulus and off-line filtered (2-1,5 kHz).

Using a CEDTM 1401 signal averager and the SignalTM software package version 2.15 (Cambrige Electronic Design), the 225 responses are averaged in three sequential blocks of 75 stimuli.

The latence of the first positive (p13) and the first negative (n23) peak of the unrectified VCR were measured and the raw peak-to-peak amplitude, ipsilateral to the stimulated ear.

Corrected amplitude is measured by dividing peak-to-peak amplitude/mean rectified EMG activity the 20 ms prior to the stimulus.

Habituation and corrected habituation were calculated as percentage change of raw and corrected amplitudes between the first and third block of averingings.

VEMP UTILITY

VEMPs are useful diagnostic test in a variety of peripheral and central vestibulopathies. The diagnostic utility of the VEMP has also been examined for neurological disorders.

VEMPs are modified in peripheral vestibulopathies:

- attenuated or absent in vestibular neuritis, herpes zoster oticus, late Meniere's disease, vestibular schwannomas, and otosclerosis and
- increased in the superior semicircular canal dehiscence – Tullio phenomenon (1).

In central vestibulopathies (multiple sclerosis, acoustic neuromas compressing the brainstem,

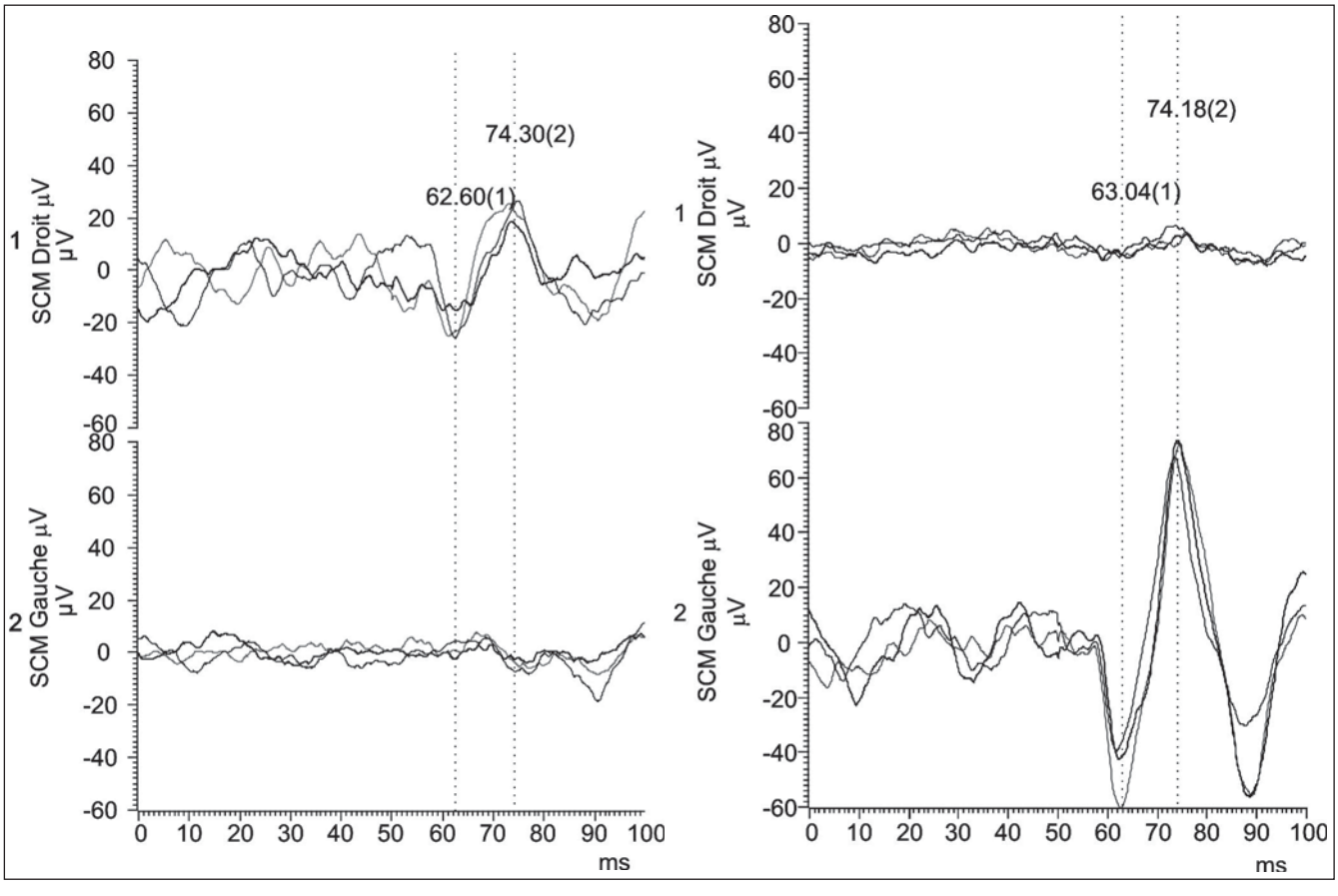

FIGURE 1. *Illustration of traces of vestibulo-collic reflex obtained from the right (up) and left (down) sternocleidomastoid muscle in a patient with migrainous vertigo. The acoustic stimulus started at 50 ms. The VCR was obtained as a waveform with an initial positivity p13 followed by a negativity n23. The three different couloured traces correspond to the three blocks of averingins.*

spinocerebellar degeneration) VEMPs recordings disclosed prolonged p13, n23 latencies and decreased amplitudes (1).

Most authors conceptualized MV as a vestibular disorder Liao and Young found delayed or absent VCR responses in 10 out of 20 patients with basilar-type migraine (3).

In a first study of VEMP in migraine without aura and migraine with aura, authors (Jean Schoenen and co-workers) reported significantly small VCR amplitudes, in migraine patients versus healty volunteers and also the lack of physiological habituation (even potentiation) during stimulus repetion in migraine patients (4).

Considering this background, a second study of VCR in migrainous vertigo patients in Headache Research Unit, Department of Neurology University of Liege, Belgium found similar abnormalities of vestibule-collic reflex in migraineurs with and without vertigo (5).

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