

## Ocular vestibular evoked myogenic potential (oVEMP) responses in acute vestibular neuritis

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## Letter to the editor

The vestibular afferents which mediate ocular vestibular myogenic potentials (oVEMPs) evoked by air and bone-conducted stimuli remain controversial, although these are likely to consist of irregularly discharging afferents arising from the otoliths (Curthoys et al., 2006). Shin et al. (2011) have recently reported the changes occurring for oVEMPs and cervical VEMPs (cVEMPs) evoked by air conducted sound (ACS) in vestibular neuritis (VN) classified as affecting the superior, inferior or both divisions of the vestibular nerve. They found oVEMPs affected in superior VN while cVEMPs were apparently normal, with the converse for inferior VN. They proposed that this indicated that oVEMPs were the result of utricular activation.

Limitations in the conclusions drawn by Shin et al. (2011) as to the likely origin of the oVEMP were well summarized in the accompanying editorial (Papathanasiou, 2011). There is already agreement that the superior division of the vestibular nerve appears to mediate oVEMPs (Curthoys et al., 2011; Govender et al., 2011), as the results of Shin et al. (2011) confirm, but this division contains both utricular and saccular fibres, so these observations do not allow any definite conclusion as to which are responsible. Govender et al (2011) proposed three possible hypotheses that could explain these observations as well as the observed higher threshold for the oVEMP compared to the cVEMP. In principle, observations in other vestibular diseases can distinguish these between the three possibilities.

The tuning properties of the responses for the oVEMP and the cervical vestibular evoked myogenic potential (cVEMP) to a given stimulus type are virtually the same (Todd et al., 2009) and these authors proposed an otolith resonance theory to explain these findings. This hypothesis proposes that the utricle and the saccule have distinct resonant frequencies, the utricle around 100 Hz and the saccule around 500 Hz, that underlie the tuning properties. This hypothesis suggests that the saccular response to air-conducted (AC) sound is a consequence of both the proximity of the saccule and its resonant frequency. Recently we have shown that tuning for AC oVEMPs has two peaks of response, as predicted by the otolith resonance theory, with the larger around 500 Hz and the smaller around 100 Hz. It is plausible to equate the smaller response with utricular excitation (Zhang et al., 2011).

Shin et al. (2011) have confirmed earlier findings that the fibres mediating AC oVEMPs appear to travel via the superior vestibular nerve, but as pointed out, these may still be either saccular or utricular. Despite their implication that cVEMPs do not receive utricular projections (Shin et al., 2001; Fig 4) previous animal studies provide evidence for a utricular pathway to the neck muscles (Fukushima et al., 1979; Kushiro et al., 1999). In humans, evidence for this has also been obtained using bone-conducted (BC) lateral accelerations applied at the mastoid (Rosengren et al., 2009) and cVEMPs produced by this stimulus show high rates of abnormality in vestibular neuritis (Govender et al., 2011). To suggest that the pathways from the otoliths to either the sternocleidomastoid

or the inferior oblique muscles are unique to one or other otolith organ is not supported by current evidence.

Shin et al. (2011) confirm the conclusion of Govender et al. (2011) that AC cVEMPs and AC oVEMPs are particularly suited for diagnosing and classifying vestibular neuritis, providing responses from the unaffected side are present. The pattern of the changes in oVEMPs and cVEMPs from the affected side can then subdivide vestibular neuritis as either affecting the superior division of the vestibular nerve (intact cVEMPs, reduced oVEMPs), the inferior division of the nerve (affected cVEMPs, spared oVEMPs) or both (both reflexes affected).

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