Letter to the Editor

In a recent paper Fröhlich et al. examined both the cervical vestibular evoked myogenic potentials (cVEMP) and ocular vestibular evoked myogenic potential (oVEMP) responses elicited by both air-conducted (AC) and bone-conducted (BC) stimuli amongst cochlear implant (CI) patients [1]. We are convinced that the point of interest is essential in the clinic as the results of the vestibular screening can be decisive in side-selection for first CI or be a contraindication for a sequential CI [2]. They conclude that BC stimulation is superior to AC stimulation when trying to elicit both cVEMP and oVEMP in CI patients, as BC-stimulation gives a higher response rate. They further concluded that absent VEMP responses after AC-stimulation should be interpreted with caution amongst CI patients. While we agree with the latter conclusion, we believe that the complexity of BC induced cVEMP deserves quite some considerations before shifting stimulus protocols for cVEMP from AC to BC stimuli.

When stimulating with BC vibration, it being at Fz or on the mastoid, a bilateral otolithic stimulation will be elicited, as only negligible dampening will occur [3]. This sets up the premise that the vestibulocollic reflex (VCR) must be unilateral if definitive conclusions for each pair of otoliths are to be made. AC-stimuuli at intensities that activate sacculus exclusively fulfill these assumptions, yet for BC-stimuli, activating both utriculus and sacculus, multiple studies show bilateral vestibular evoked potentials of the sternocleidomastoid muscle [3–5]. It is in this context worth noting that these results were found on patients with unilateral vestibular loss, e.g., after vestibular neurectomy. The crossed responses shown in vestibular unilateralised patients followed an inverted pattern which with the original denotation were are called n12 and p20, yet a distinct second n wave occur [4, 5]. Even though it remains speculative, one could get the notion that an inverted crossed potential could mistakenly be recognized as ipsilateral cVEMP, especially when the average latency of the p13 signal on the CI-side for the BC stimulus in the study of Fröhlich et al. approximates that of p20 as described in some of the original studies examining the VCR [4, 5]. The second n-wave could then be recognised as the n23 of the expected wave configuration, as the second n wave of the inverted signal seems to occur in the exact same time window. In such a case it would be concluded that a patient has preserved their cVEMP, even though a damage of both otoliths at the side of interest is present, i.e., a false-positive result.

These considerations were not mentioned by Fröhlich et al., yet even if they were taken into account, we find the conclusions draw too adamant. The potential hazards of a false-positive response outweigh that of a false-negative, as a patient may incorrectly be encouraged to have a sequential CI with potential bilateral otolithic damage.

Additionally, the AC-stimulus used in the study may account for some of the lack of responses, as a 1-cycle stimulus, may be too weak or out of tune to elicit the cVEMP, even though an intensity of 100 nHL dB is used. The reason to shorten the stimulus could be to limit the sound exposure, yet if the rationale were to show the superiority of the B81 transducer over AC stimuli, optimal conditions for AC should have been sought [6, 7].

In our own vestibular laboratory we have the exact same setup as Frölich et al., with Eclipse (Interacoustics, Middelfart, DK) being both tone generator, data collector and analyser. We use the same transducer, ER-3A (3M St. Paul, MS USA). In an effort to optimise our own AC stimulation protocol, we analysed the frequency response using multiple 500 Hz toneburst configurations in a calibrated ear simulator, IEC 711 coupler. One configuration distinguished itself substantially from the others, the 0-cycle rise/fall 1-cycle plateau configuration used in the paper at hand, please confer Fig. 1. Peak energy was surprisingly not delivered at 500 Hz but around 350 Hz, with
significant frequency splatter. In this light it would additionally be a misnomer even to call the stimulus a tone, as it nowhere reassembles a tone. It would be more accurate to simply call it a transient.

Sadly, we are still in an aporia in how to meaningfully implement cVEMP in the evaluation of CI patients, yet this paper adds important knowledge on the matter, and will serve as inspiration to further studies.

Yours Truly
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References


