

A Comparison of Stimulus-Frequency and Distortion-Product Otoacoustic Emissions for Monitoring Ototoxicity-Induced Hearing Loss

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In normal ears, otoacoustic emission (OAE) input-output (I/O) functions show a rapid, linear growth region at low input levels and a gradual, compressive growth region at moderate levels. The compressive-region slope of the I/O function (in dB/dB) may represent basilar membrane compression and can be used to extrapolate an OAE threshold that is correlated with pure-tone threshold [Boege and Janssen, J. Acoust. Soc. Am. 111, 2002]. Both OAE compression rate and threshold are likely associated with outer hair cell function and may be altered by ototoxic drugs. Stimulus-frequency (SF) and distortion-product (DP) OAE were measured in 20 normal-hearing and 19 hearing-impaired control subjects and in 9 experimental subjects receiving ototoxic drugs. SFOAEs extracted using a suppression paradigm (probe= f_2 , suppressor= f_1 , where $f_2/f_1=1.03$) and DPOAEs ($f_2/f_1=1.2$) were recorded at 11 f_2 s (1 to 10 kHz) for L_2 held constant at a moderate level. I/O functions were obtained for L_2 varied in 5-dB steps (from 20 to 60 dB SPL for SFOAE and 20 to 65 dB SPL for DPOAE) and L_1 chosen to optimize the OAE level. I/O functions were obtained for each f_2 in normal-hearing controls, and for a limited (one-octave) range of f_2 s near the highest frequency able to elicit a reliable OAE in hearing-impaired controls and experimental subjects. In each subject, OAE measurements were repeated on at least three occasions. SFOAE and DPOAE I/O function growth in normal ears often was compressive with mean slopes similar to those reported previously [Schairer et al., J. Acoust. Soc. Am. 114, 2003]. Compared to normal ears, SFOAE and DPOAE I/O functions in impaired ears had poorer thresholds, reduced maximum amplitudes and were less compressive with slightly steeper slopes. A comparison of SFOAE and DPOAE I/O functions was used to refine estimates of OAE threshold. Preliminary findings regarding the capability of DPOAE and SFOAE for predicting hearing change in patients receiving ototoxic drugs will be discussed. Supported by the Department of Veterans Affairs Rehabilitation Research and Development Service (C3213R and E3239V).