Assessing preclinical noise-induced cochlear damage with otoacoustic emissions

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ABSTRACT

Otoacoustic emissions (OAEs) measurement seems to be a sensitive method of detecting early cochlear damage due to noise exposure.

The aim of this study was to assess transient-evoked otoacoustic emission (TEOAE) and distortion product otoacoustic emission (DPOAE) in ears of normal hearing subjects exposed to noise at the workplace and non-exposed to noise. The study population comprised in total 361 subjects (722 ears), ages 21-61 years, selected from over 3500 subjects database. Noise-exposed subjects had either normal hearing on both sides (hearing thresholds ≤ 20 dB HL at all frequencies) or normal hearing on one side and a small notch (no deeper than 30 dB HL) at high frequencies on the other side, while all non-exposed subjects had normal hearing on both sides. All analyses were matched in age, gender and years of employment.

Although there were no audiometric differences between normal hearing subjects of exposed and non-exposed to noise groups, TEOAE parameters of the noise-exposed group were significantly weaker over entire range of frequencies (1-5 kHz), while DPOAE parameters were significantly weaker predominantly in the high frequency region (above 3 kHz). Furthermore, the ears of noise-exposed subjects with normal hearing exhibited exactly the same decrease in OAEs like the contralateral ears of the same subjects exhibiting audiometric notches.

We conclude that the changes in OAE due to prolonged occupational exposure to noise precede the changes in audiometry. OAE decrease may indicate minimal damage to the outer hair cells, while audiometric hearing threshold shift results from substantial hair cell loss