P091

AUDITORY IMPLANTS

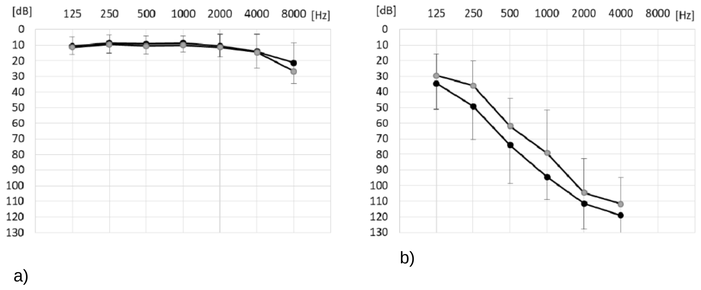
Can an unaided localization ability be a predictor of CI squelch benefit in patients with residual hearing in the implanted ear

A. Lorens, A. Obrycka, P. Skarzynski, H. Skarzynski

.Inst. Physiology and Pathology,World Hearing Center,Warsaw,Poland.

Background

An interesting aspect of our study is that the patients differed significantly from those tested in previous studies. Our patients were unique in the way they had successful hearing preservation surgery in one ear and normal or close to normal hearing (NH) in the other ear. Thus, we were able to explore the value of preserved LF hearing in the implanted ear for binaural integration effects of squelch, assuming that all binaural cues are available from the NH ear.



Mean preoperative (grey circles) and postoperative (black circles) audiometric thresholds (n = 11) for: (a) non-implanted ears; (b) implanted ears. Whiskers show standard deviations.

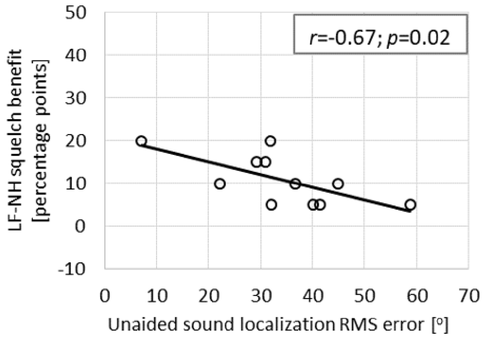
Objectives

We wanted to measure the relationship between the benefit gained from the squelch effect and the patient's unaided localization ability (in which patients use pre-served low frequency hearing on the CI side, with CI switched off, and NH from the contralateral side). Our rationale was that when a patient listens via preserved LF hearing in one ear and NH in the other, localization will be based mainly on ITDfine and minimally on ILD (interaural level difference). Our study population relied on ITDfine, since both unaided localization ability and the mechanism underlying the benefit from the binaural integration effects of squelch depend on this factor.

Materials and Methods

11 adult CI users with preserved low frequency hearing in the im-planted ear, and with normal hearing or mild hearing loss in the contralateral ear, were included in the study. Patients were implanted with Med-El devices at the Institute of Physiology and Pathology of Hearing, Poland, in their poorer-hearing ear using the six-step round-window approach surgery developed| by Skarzynski et al. The squelch effect was evaluated by presenting words from a loudspeaker in front of the subject and noise at 90 degrees from the midline to the implanted ear. The sound localization test was performed in an anechoic chamber using a custom-made system of 11 loudspeakers arranged in a semicircle 2 m in diameter in the frontal horizontal plane; the loudspeakers, hidden behind a curtain, were separated by 10° and ranged from –50° (left) to 50° (right).

Results



Pearson correlation between squelch benefit (y-axis) and unaided sound localization error (x-axis) (r = correlation coefficient; p = significance level).

- A significant negative correlation between CI benefit via a squelch and unaided localization error.
- No correlation between squelch benefits in the LF-NH listening configuration and PTA[125-500]| in the CI ear (r = –0.28, p = 0.41).
- No correlation between unaided sound localization error and PTA[125-500] in the CI ear (r = 0.48, p = 0.14).

Conclusion

Since both the squelch effect and low frequency localization rely on sensitivity to ITDfine, unaided localization ability can serve as a predictor of CI squelch benefit in patients with preserved low frequency hearing in the implanted ear. The binaural integration effect of squelch depends on factors other than audibility. It is negatively correlated with localization error, although not with the hearing threshold of preserved LF hearing (PTA[125-500]). This finding provides additional evidence for the idea that implant recipients with preserved acoustic hearing have continued access to fine structure cues, which should provide greater binaural integration benefits.

References

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