COCHLEAR IMPLANTS IN THE ELDERLY: THE BETTER HEARING PROSTHESIS?

Uwe Baumann

Klinikum der J.W. Goethe-Universität, HNO/Schwerpunkt Audiologische Akustik, Frankfurt a.M., Germany

Corresponding author: Uwe Baumann, Klinikum der J.W. Goethe-Universität, HNO/Schwerpunkt Audiologische Akustik, Theodor-Stern-Kai 7, 60590 Frankfurt a.M., Germany, e-mail: uwe.baumann@kgu.de

Abstract

Background: Cochlear implantation in the elderly (above the age of 70 years) as a treatment for profound sensorineural deafness is to some extent regarded with skepticism. First, the perception of sound transmitted by electrical stimulation is regarded as being generally too unfamiliar for elderly recipients to adapt to. Second, retrocochlear neural transduction and processing are supposed to underlie age-related degeneration and therefore a cochlear implant (CI) may give only poor outcomes in seniors.

Materials and Methods: Two cohorts of elderly people with hearing disabilities aged 60 years and above were studied. Retrospectively gained results in 129 hearing aid (HA) users (average age 72 years) and 115 CI recipients (average age 69 years, collected in our department) were investigated. Freiburger monosyllable scores were measured at 65 dB speech level in the best aided condition (FMS 65dB) and compared to the best monosyllable score (speech level set below uncomfortable loudness to achieve highest score) measured in the unaided condition with headphones.

Results: Verification of hearing aid fitting showed satisfying results in only 25% of all tests, whereas an average improvement of Freiburger monosyllable scores between 50% and 70% (range 5% to 100%) was found in the CI group, nearly independent of age, when compared to hearing aid results before surgery. Aided performance in the HA group was inferior compared to the CI group (FMS 65 dB: HA 52.7%, CI 62.8%). Additionally, age at surgery (range 60 to 84 years) showed no significant correlation to benefit after rehabilitation.

Conclusions: The results demonstrate a severe lack of fitting success in the group of seniors with hearing aids in this study. The seniors in the study fitted with a cochlear implant showed very good results, without any evidence of age-related problems. When deciding on cochlear implant surgery in seniors, the faster pace of progression of hearing loss with age should be considered.

Introduction

To some extent, cochlear implantation in the elderly above the age of 70 years as a treatment for profound sensorineural deafness is regarded with scepticism. On the one hand, the perception of sound transmitted by electrical stimulation is regarded as being generally too unfamiliar for elderly recipients to adapt to (Labadie et al, 2000). On the other hand, retrocochlear neural transduction and processing are supposed to underlie age-related degeneration and therefore a cochlear implant (CI) may generate only poor outcomes in seniors (Welsh et al., 1985). The present study compares speech test results of hearing aid users to those of cochlear implant users, challenging the issue that seniors fitted with a cochlear implant may have age-related problems concerning adaptation and acclimatization to the unfamiliar hearing sensation with the cochlear implant

Materials and Methods

A comparison of results obtained in two groups of elderly people with hearing disabilities aged 60 years and above was carried out by means of retrospectively gained results in 129 hearing aid users (average age 72 years, time span 2000–2011) and 115 CI recipients (average age 69 years, collected in our department from 1996–2011). The group of hearing aid users was recruited from patients who presented for testing their hearing aid settings in the Department of Otolaryngology and who were not eligible for cochlear implant treatment; the CI recipients were recruited from patients at the clinic who were examined as part of their regular implant check. The CI group included unilateral, bilateral, and bimodal cochlear implant users. CI recipients with asymmetric hearing loss or single-sided deafness were excluded from the study. The minimum experience of hearing with the cochlear implant was 3 months. Patients with clear signs and symptoms of dementia, Alzheimer's disease, and morbus Parkinson, as far as known, were excluded from the study.

The results of both groups were determined using the "Freiburger" speech test in quiet. This test includes a monosyllable word test. The metric was unaided *best monosyllable score (BMS)*. In addition, the monosyllable scores at 65 dB (free field-level condition [FMS 65 dB], distance 1.2 m to speaker) with hearing aid (HA) or cochlear implant were measured.

In binaural CI or HA fittings, the best result from either left, right, or both sides was used as a measure for the success of the patient. The subjects were divided into three age groups: 60–65, 66–73, >73 years. There were, respectively, 23/38, 51/38, and 56/39 (HA group / CI group) patients in the same age group.

Results

The average unaided best monosyllable score (BMS) in the HA group was 57.9%, 79.4%, and 69.5%, depending on age group (60–65, 66–73, >73). With hearing aids, average FMS 65 dB score was 44.8%, 58.0%, and 49.7%, respectively. The difference between unaided BMS and aided FMS 65dB was significant in all age groups ($p<0.05$). On average, aided monosyllable scores were lower than the best scores obtained by headphone presentation, reflecting insufficient hearing aid fitting.

BMS in the unaided condition in over 50 subjects of the HA group was at least 90%, while roughly the same proportion of patients in the CI group achieved scores less than 10% in the unaided condition. The comparison of results obtained with HA (FMS 65 dB) and BMS in the unaided condition showed that only in 25% of all cases a satisfactory HA fitting was present (difference between BMS and FMS 65 dB ≤0%). In 25% of all patients in the HA group, a completely inadequate HA fitting was observed (difference BMS/FMS 65 dB ≥30%).

Prior to implantation, aided average FMS 65 dB in the different CI age groups was 9.6%, 12.4%, 9.2% (60–65, 66–73, >73), after respective fitting and rehabilitation scores as high as 67.9%, 63.1%, and 57.6% were reported. Differences between pre-op and post-op aided scores were highly significant in all age groups ($p<0.001$).

In comparison to the results of the HA-fitting before implantation, the CI-treated patients showed an improved FMS 65 dB score with averages between 50% and 70% (range between 5% and 100%). This effect could be observed nearly independent of age group.

The group of CI-treated patients with the lowest benefit with HA prior to implantation ($n=87$, FMS 65 dB with HA 0%) showed an improved FMS 65 dB score of almost 60% post-CI rehabilitation. Even patients with comparatively higher FMS 65 dB before surgery achieved a significant increase after rehabilitation.

A subgroup analysis of patients with recent implant and speech processor models ($n=75$) showed that 75% of patients in this group reached more than 60% FMS 65dB (median FMS 65 dB at 70%). The age (range 60–84 years) at CI surgery showed no significant correlation. However, a comparison of the age groups 60–65 years and older than 73 years revealed a significantly lower FMS 65 dB (t-test, $p<0.01$) in the group of older seniors.

Discussion

Despite better hearing thresholds and higher unaided best monosyllable scores in the HA group (BMS average including all age groups HA 71.4%, CI 19.6%), aided performance in the HA group was inferior compared to the CI group (FMS 65 dB HA 52.7%, CI 62.8%). This result shows that careful optimisation of hearing aids is urgently required for the majority of elderly patients.

The seniors in the study fitted with a cochlear implant show very good results, without any evidence that age-related problems concerning adaptation and acclimatisation to the unfamiliar hearing sensation with the implant occur. Meanwhile, even patients beyond the 90th year of life were supported successfully with a cochlear implant. The assumption that an age-related degeneration of the auditory nerve prohibits satisfactory results with cochlear implants in the elderly seems refuted by the results of this study.

Other studies have shown that by improving the listening situation with cochlear implants, a significant increase in quality of life, a reduction of tinnitus distress, and a reduction of general stress can be achieved as well (Olze et al., 2012). The poor results in the hearing aid group of senior citizens may be distorted by the selection of subjects, since only patients with inadequate hearing success find their way to the University Hospital to check hearing aid fitting.

The present results have highlighted the lack of hearing aid fitting success in the group of seniors in this study. When deciding on cochlear implant surgery in seniors, the faster pace of progression of hearing loss with age should be considered.

References:

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