

Hearing-impaired seniors with profound hearing loss: Too many with inadequate hearing aid fitting!

Schwerhörige Senioren mit hochgradiger Hörminderung: Hörgeräteversorgung unzureichend!

Abstract

Older people with severe to profound hearing loss are often inadequately supported with conventional acoustic hearing aids. In this study, the results of hearing aid fitting for seniors aged 70 and older who suffered from progressive hearing loss and later received a cochlear implant (CI) were compared with the results obtained 12 months or later after CI surgery. The results show that hearing-impaired seniors with severe to profound hearing loss often suffer from poor and inadequate hearing aid provision over a long period.

Keywords: cochlear implant, CI outcome, speech perception

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Zusammenfassung

Fragestellung: Die retrospektive Studie beschäftigt sich mit der Frage, mit welcher Hörgeräte-Versorgungsqualität sich progredient schwerhörige Senioren im Universitätsklinikum Frankfurt vorstellen, die später eine Cochlea-Implantat(CI)-Versorgung erhalten haben. In einer höher betagten Altersgruppe könnten Effekte einer altersbedingten Degeneration bestehen. Daher wurde untersucht, ob nach Abschluss der CI-Rehabilitation gegenüber der präoperativen Hörgeräteversorgung eine Steigerung des Freiburger Einsilbertest(FE)-Ergebnisses um mindestens 20% erzielt werden konnte.

Methoden: Insgesamt 62 CI-Patienten (76 Ohren, MEDEL FLEX Elektroden) mit einem Mindestalter von 70 Jahren bei Implantation nach Januar 2016 wurden aus der internen Datenbank als Studienkohorte ermittelt (Mittelwert 78 Jahre). Als Variablen wurden das Tongehör vor Implantation (PTA4, PTALOW), das max. Ergebnis des FE bei Kopfhörerdarbietung (MAX-FE), das Ergebnis des FE mit Hörgerät vor OP (Freifeld 65 dB SPL, HG-FE) sowie das Ergebnis mit CI mindestens 12 Monate post-OP (Freifeld 65 dB SPL, CI-FE) aufgezeichnet.

Ergebnisse: In etwa 2/3 der Fälle bestand prä-OP selbst mit optimierter Hörgeräteversorgung kein Einsilberverschöndern mehr (Mittelwert 8%). Der MAX-FE Wert (Mittelwert 16%) als Kennzahl der Qualität der Hörgeräteversorgung wurde nur in N=8 Fällen erreicht oder übertroffen. Nach OP und CI-Reha betrug der CI-FE 57,2%. In 68/76 Fällen wurde im FE eine Steigerung um 20% erzielt. Es wurden keine signifikanten Korrelationen zwischen CI-FE und PTA4, PTALOW oder Alter bei CI-Versorgung beobachtet.

Schlussfolgerungen: Obwohl in Deutschland ausreichender Zugang zu einer Cochlea-Implantat Versorgung besteht, bleibt dieser Versorgungsweg häufig ungenutzt, was die Versorgungssituation schwerhöriger Senioren weiterhin unzureichend macht. Es stellt sich die Frage, welche Barrieren existieren und wie diese überwunden werden können, um eine effektivere Unterstützung zu gewährleisten.

Schlüsselwörter: Cochlea-Implantat, CI-Ergebnisse, Sprachverstehen

Introduction

The cochlear implant (CI) is a standard treatment for patients with severe to profound hearing loss and complete deafness [1], [2]. Over the years, the proportion of older patients receiving CI treatment has increased significantly [3]. However, a large number of older CI candidates are reluctant to seek help as early as possible. This age group often refuses CI fitting on the reasoning that the outcome may be poor considering their age and that the remaining lifetime does not justify the need for CI surgery [4]. It is also argued that neuronal degeneration can occur with advanced age, so that a CI may not be able to adequately compensate for the significantly reduced transport of acoustic information [5]. The aim of this study was to investigate in a cohort of seniors aged 70 and above the postoperative CI aided speech perception results compared to the outcome of the preoperative hearing aid fitting.

Material and method

The study was performed retrospectively in the period from September 2023 to October 2023 (study approval by the local Ethics Committee of the Department of Medicine at the University of Frankfurt, case number 2023-642). A total of 62 CI patients (34 female, 76 ears, FLEX electrodes, manufacturer MED-EL, Innsbruck, ears treated as individual cases) with a minimum age of 70 years at implantation after January 2016 were identified from the internal database as the study cohort, whereby patients with insufficient German language skills and cases with known neurological disease (dementia, auditory nerve deprivation, etc.) were excluded. The mean age of the patients was 78 years (min. 70 years/max. 89 years). Speech perception in quiet was measured using the Freiburg monosyllabic test [6]. The variables recorded were the hearing loss before implantation (pure tone average, PTA4, PTALOW), the maximum score of the Freiburg monosyllabic test with headphone presentation (MAX-FMS), the result with hearing aid (HA) before surgery

(free field 65 dB SPL, HA-FMS) and the result with CI at least 12 months post-surgery (free field 65 dB SPL, CI-FMS). The implant electrodes were distributed as follows: N=66 Flex28, N=4 FlexSoft, N=3 Flex24, N=3 Flex26, and the processor devices were Sonnet, Sonnet 2, Rondo 2, Rondo 3. When necessary, the ear opposite to the implant was masked during free field presentation via insert earphone and masking noise was applied (sound level $L_m = 70$ dB).

Results

In around 2/3 of cases, monosyllabic intelligibility no longer existed pre-operatively (HA-FMS score=0%), despite optimized hearing aid fitting (Figure 1). Only a small number of cases obtained 30% or more HA-FMS score, depicted as outliers (Figure 2). On average, aided FMS score was 8% with median 0% and the MAX-FE score was on average 16% (Figure 2). Comparing the highest individual FMS score with the aided test condition results, only N=8 cases achieved MAX-FMS or more (Figure 3, left). After surgery and CI rehabilitation, the CI-FMS average score was 57.2% (median 60%, Figure 2). In 68/76 cases, an increase of 20% FMS score or even more was achieved. Only a small number of cases (N=6) had poorer FMS score values below 30% (outliers Figure 2, box CI-FMS).

When investigating the potential dependence of CI outcome (CI-FMS) from age at surgery, a correlation analysis between age at implantation and CI-FMS showed no significant effect of age (Spearman's $\rho = .197$, $p = .09$). Likewise, no significant correlation was reported between CI-FMS and PTA4 ($\rho = -.081$, $p = .49$) and PTALOW ($\rho = -.112$, $p = .34$).

To further investigate the impact of residual hearing on CI outcome, a subgroup analysis was performed excluding cases with no or very poor MAX-FMS (less than 10%) prior to surgery. This resulted in N=37 remaining cases. CI-FMS depending on subgroup was 53.2% in the poor MAX-FMS group, and 61.2% in the residual speech perception cohort (data not shown). A two-sided t-test reported

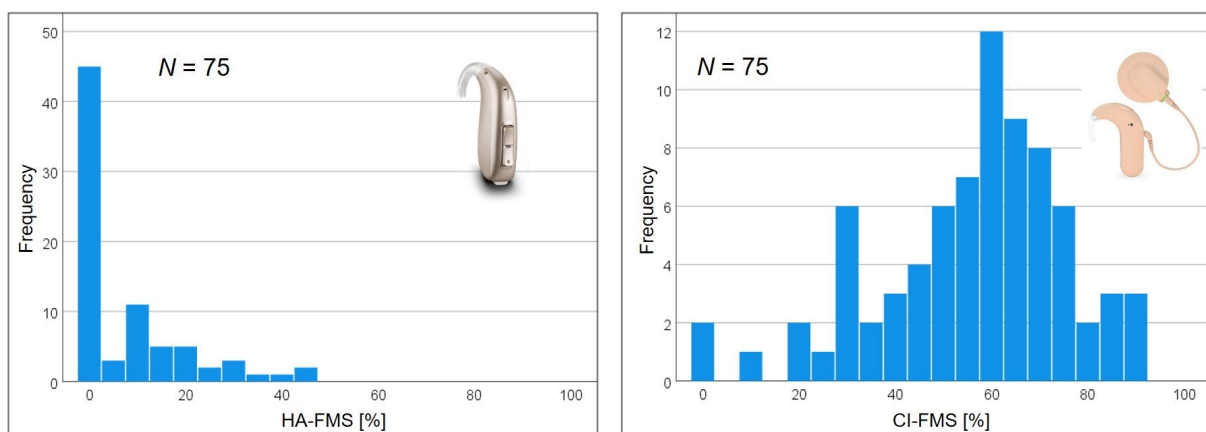


Figure 1: Histograms of pre- and postoperative monosyllabic speech perception scores. Left: hearing aid 65 dB free field prior CI provision (HA-FMS). Right: CI-FMS score after at least 12 months of CI use

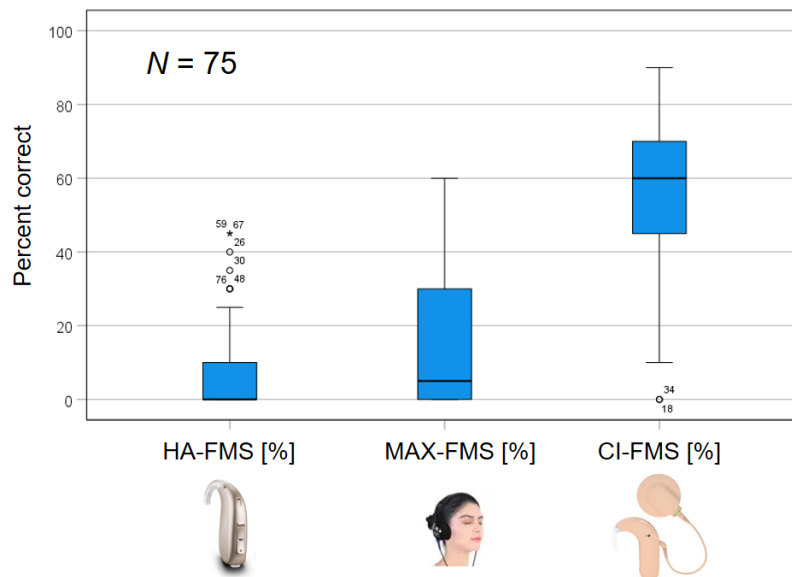


Figure 2: Boxplots for pre- and postoperative monosyllabic speech perception scores

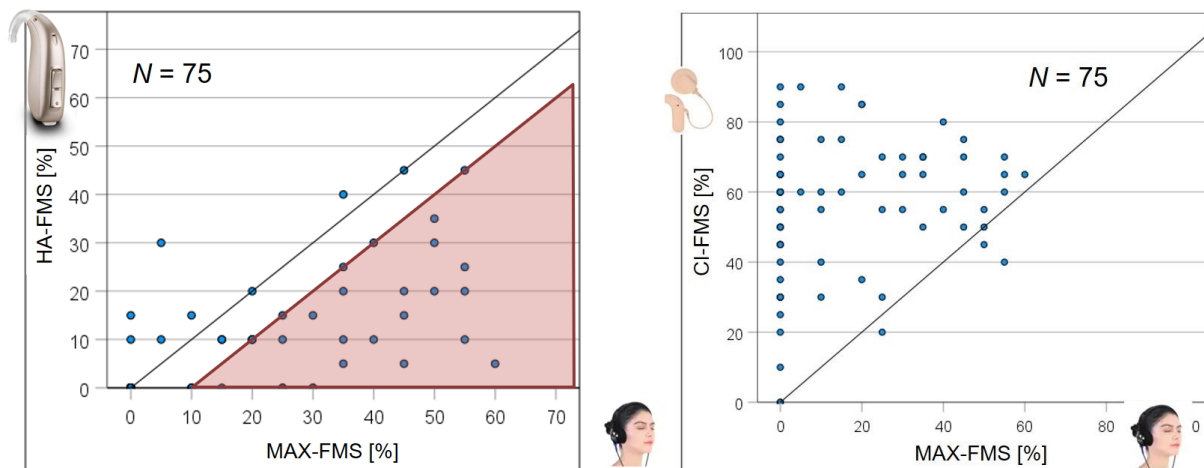


Figure 3: Scatterplot comparing MAX-FMS (highest monosyllabic score, headphone presentation), hearing aid (left) prior surgery and CI (right) supported monosyllabic score 12 months post surgery. Angle bisector: line of equivalent perception scores. Red triangle: MAX-FMS 10% lower than angle bisector, indicating insufficient gain with hearing aid

no significant differences between subgroups (95%-CI [-16.34, .49]), $t(73)=-1.876$, $p=0.65$). As in the overall group, no correlation was found between CI-FMS, PTA and PTALOW in the subgroup with more pronounced residual hearing.

A comparison of the effectiveness of hearing aids and CI devices in relation to MAX-FMS shows a clear advantage for the CI (scatterplots Figure 3). Indicated by the red triangle in Figure 3, left, it can be seen that in a high proportion of cases with significant monosyllabic perception, the results with hearing aids are inadequate. The opposite is the case for the results with CI (Figure 3, right). Only in a few cases ($N=3$) was the monosyllabic score determined with headphone measurements not achieved.

Discussion

The results of the present study clearly demonstrate the impressive success of CI rehabilitation in a group of seniors of advanced age (mean age 78 years) with severe to profound hearing loss. On average, the improvement in reference to the preoperative test result obtained with hearing aids of the whole group of cases ($N=75$) was 49.0% (SD 20.7). These results are in line with recently published studies in a smaller cohorts ($N=35$; $N=60$) of slightly younger (mean age 76.1; 65.8) senior CI users [3], [7].

Regarding the distribution of the gain after CI rehabilitation compared to the preoperatively determined result with hearing aids in a subgroup with residual hearing ($N=37$), only 5 cases (13.5%) did not achieve an improvement of at least 20% monosyllabic score. This observation is supported by [8], where the authors reported no case

of performance decrease compared to preoperative results in the elderly cohort of their study.

Interestingly, the results of the present study did not show a significant effect of age at surgery. This finding is contrary to several other studies [5]. However, Bourn et al. showed in their recent study that after removing the results obtained from the very old subjects (aged 90 or above) the former significant effect of age disappeared [9]. They concluded that patients between age 65 and 79 perform similarly to CI recipients between 80 and 90 years of age and should not be dismissed as potential cochlear implant candidates. Likewise Rohloff et al. reported no significant outcome differences between two different cohorts of age (18–69; 70 and older) [10].

The median of monosyllabic intelligibility with hearing aids before CI treatment was 0% in the senior group surveyed in this study. This indicates that 50% of the subjects no longer achieved monosyllabic hearing despite being best as possible fitted with hearing aids. As most of the subjects had a progressive course of hearing impairment, it can be assumed that a large proportion of them suffered from completely inadequate hearing aid provision over a long period of time. Currently, a maximal aided monosyllabic intelligibility of 60% is set as the indication for CI fitting in Germany [9]. This means that almost all participants could have benefited from an improved result from CI fitting much earlier. The possible reasons for delaying CI treatment are manifold and range from the concerns of the patients mentioned in the introduction to general anxiety about the surgery, lack of information from the hearing care professional and objections to treatment by the consultant ENT specialist at home.

Conclusion

Cochlear implantation in the elderly is highly effective; the postoperative hearing performance is dramatically improved compared to best fitted hearing aids. Although there is sufficient access to cochlear implant therapy in Germany, this treatment option often remains unused, which means that the hearing care for seniors with severe to profound hearing loss remains inadequate. The question arises as to what barriers exist and how these can be overcome to ensure more effective and timely support.

Notes

Conference presentation

This contribution was presented at the 26th Annual Conference of the German Society of Audiology and published as an abstract [11].

Competing interests

The author declares that he has no competing interests.

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