



The association of Montreal Cognitive Assessment – Hearing Impaired (MoCA-HI) scores with post-cochlear implantation speech recognition scores

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Abstract

Objective: Assess the relationship between pre-operative Montreal Cognitive Assessment – Hearing Impaired version (MoCA-HI) cognitive screening scores and post-operative speech recognition outcomes.

Study Design: Retrospective chart review

Setting: Tertiary academic medical center

Patients: Adult cochlear implant recipients who were implanted between 2022-2024.

Main Outcome Measures: Pre-operative MoCA-HI scores were obtained through retrospective chart review. Scores were then correlated to post-operative speech recognition scores (CNC words and phonemes, and AzBio sentence scores) at two performance evaluation intervals (1 month and 3-or-6 months).

Results: Twenty-nine patients with pre-operative MoCA-HI scores and post-operative speech recognition data were included in this study. Mean age was 74.3 years (\pm SD 5.7). Two patients (6.8%) had single sided deafness and the remaining were traditional CI candidates. Median pre-operative MoCA-HI score was 27 (IQR: 4, range: 17-29). 41% of patients (n=12) had pre-operative MoCA-HI scores of <26, indicating concern for cognitive impairment. Post-implantation speech recognition outcomes, as measured by CNC words and phonemes and AzBio sentence scores in quiet, were not statistically different between the two groups. Additionally, pre-operative MoCA-HI scores were not predictive of post-implantation speech recognition outcomes.

Conclusions: Pre-operative MoCA-HI scores were not predictive of post-implantation speech recognition outcomes. More evidence is needed to understand the role of pre-operative MoCA-HI scores in cochlear implant evaluation. MoCA-HI scores may be useful in providing patients with more qualitative information while counseling patients on their candidacy for cochlear implantation, setting expectations and making appropriate referrals to facilitate patient success.

Introduction

Establishing cochlear implant candidacy is dependent upon audiologic history, medical candidacy, and social support. The relationship between cognitive decline and hearing loss is a growing area of interest in the fields of otolaryngology and audiology. Therefore, the assessment of cognitive status as part of the cochlear implant candidacy evaluation is becoming more common. The Montreal Cognitive Assessment – Hearing Impaired (MoCA-HI)¹ is a variation of the traditional MoCA² developed specifically for individuals with hearing loss. Our center began implementing the MoCA-HI as a portion of cochlear implant candidacy evaluations to determine whether a referral for additional cognitive evaluation is needed prior to cochlear implantation. We aim to evaluate whether pre-operative MoCA-HI scores are predictive of post-operative cochlear implant performance on CNC words and phonemes and AzBio sentences. Previous investigations on this topic have found no association between pre-operative cognitive screening scores and post-operative speech recognition outcomes³; however, these studies did not utilize the hearing-impaired version of the MoCA. We also aim to assess the role of cognitive screeners in assisting the determination of cochlear implant candidacy.

Method and Materials

Data Collection: A retrospective chart review of all cochlear implant candidates from 2022-2024 was performed. The MoCA-HI was routinely administered in the cochlear implant candidate population who were English-speaking and 65 years of age or older at the time of their cochlear implant evaluation. Exclusion criteria: (1) candidates whose primary language is not English; and (2) non-traditional otologic candidates (i.e., simultaneous cochlear implantation and acoustic neuroma removal). Pre-operative MoCA-HI scores were correlated with post-implantation CNC words and phonemes and AzBio sentence scores at two performance evaluation intervals (1-month and 3- or 6-months post activation) were available for 29 patients.

Materials:

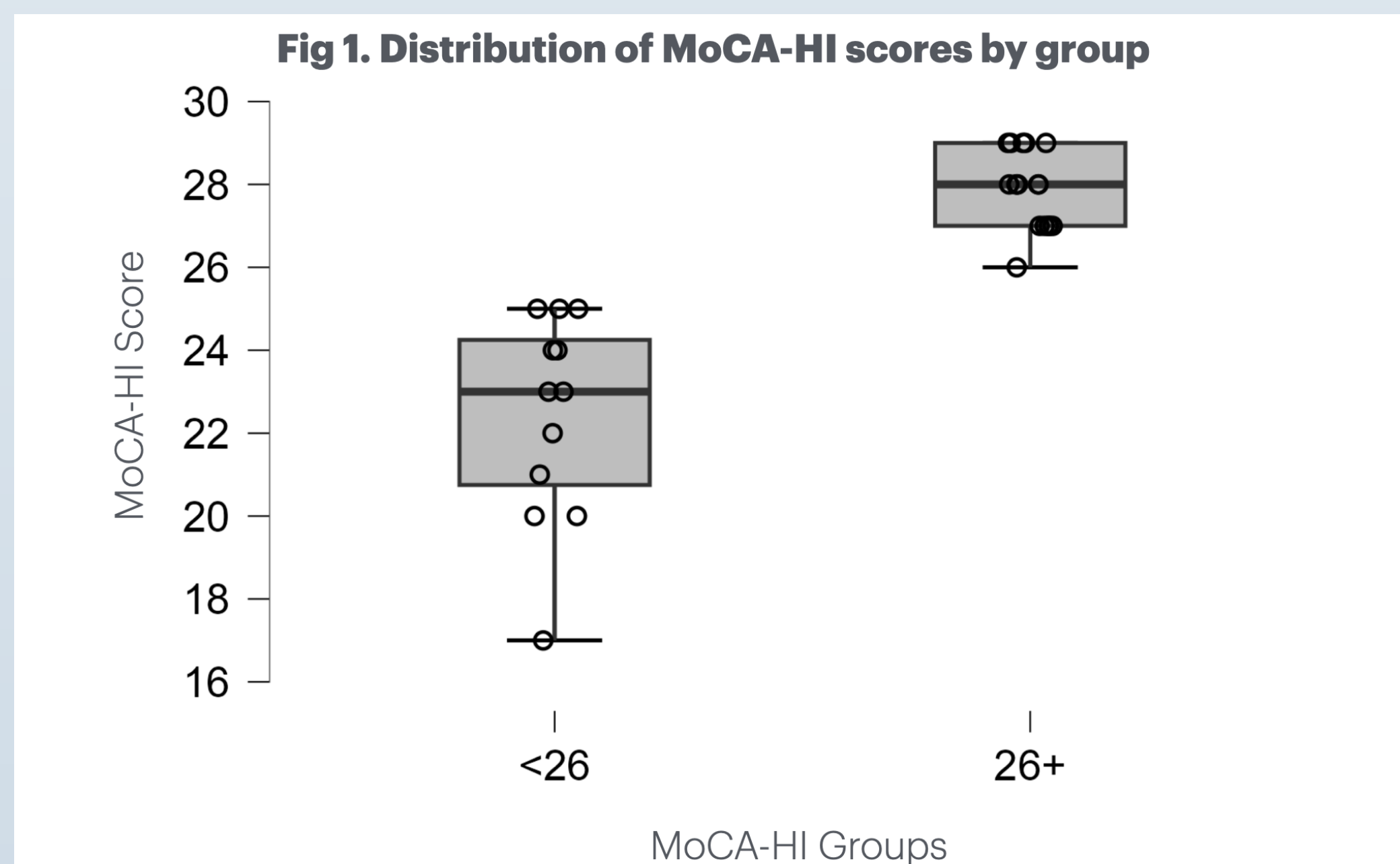
- ❖ Montreal Cognitive Assessment – Hearing Impaired (MoCA-HI)
- ❖ Consonant-Nucleus-Consonant (CNC) word lists⁴
- ❖ AzBio Sentences⁵

Scan here for



Sample MoCA-HI⁶

Figure 1. MoCA-HI scores ranged from 17 to 29, with a median of 27. Among those with normal cognitive performance (score >26), the median score was 27. Among those with cognitive impairment per the MoCA-HI, the median score was 23, with a range of 17 to 25.



Results

- ❖ Median pre-operative MoCA-HI score was 27 (IQR: 4, range: 17-29)
 - The cohort was stratified into normal (n=17, 58.6%) and abnormal (n=12, 41.4%) MoCA score groups (Figure 1)
- ❖ Mean pre-operative CNC word and phoneme scores were 10% and 19%, respectively. Median pre-operative AzBio-Q score was 13%.
 - Mean post-activation CNC word and phoneme scores at the first performance evaluation (1 month) were 49% and 65%, respectively. Median AzBio-Q score was 59%.
 - Mean CNC word and phoneme scores at the second performance (3- or 6-month) evaluation were 52% and 67%, respectively. Median AzBio-Q score was 67%.
- ❖ Total pre-operative MoCA-HI scores were not correlated with post-implantation speech recognition outcomes (CNC words, CNC phonemes, or AzBio-Q scores; $p > 0.05$ for all)
- ❖ Abnormal MoCA-HI scores were not associated with worse audiologic outcomes in our cohort (CNC words, CNC phonemes, AzBio-Q scores; $p > 0.05$ for all)
 - ❖ There is a trend towards a correlation between total MoCA score and 1-month AzBio-Q Scores ($r: 0.454, p = 0.067$)

Fig 2. Pre-operative and 1-month AzBio-Q scores by MoCA-HI group

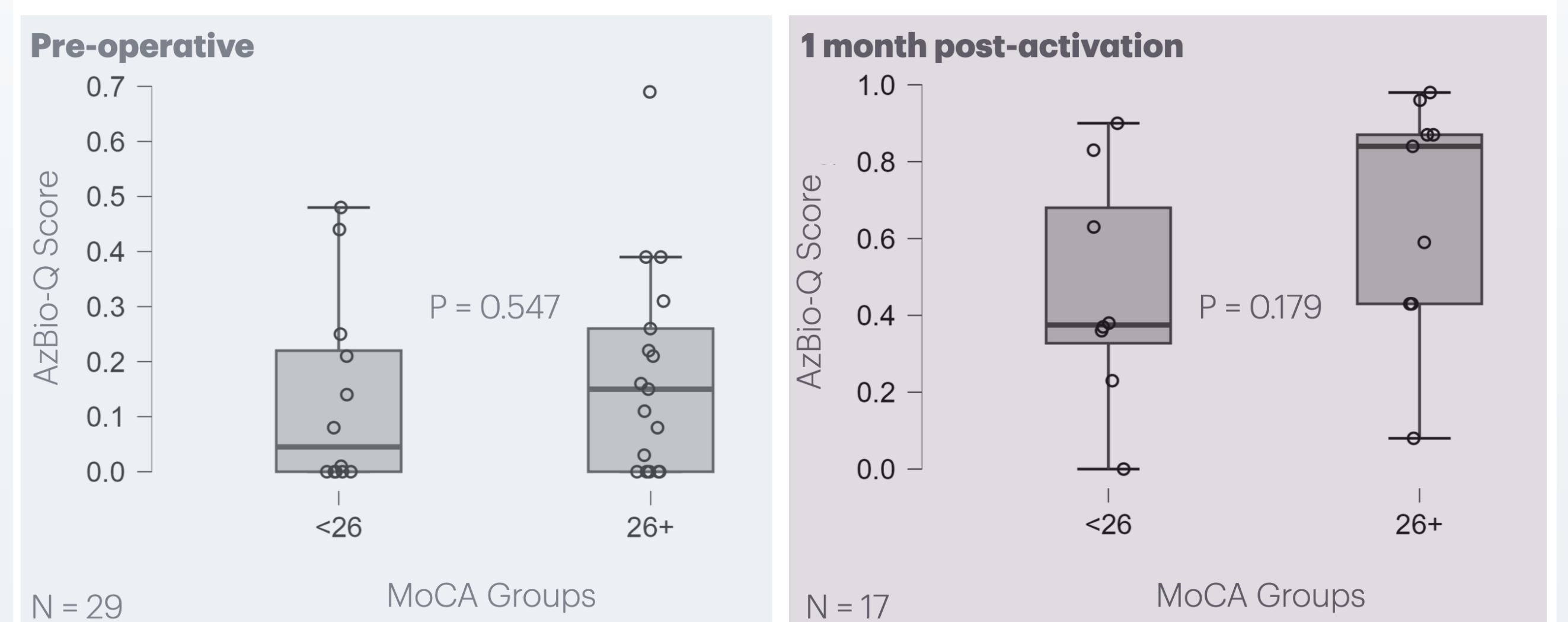


Figure 2. When examining by the stratified MoCA groups, we found no differences in AzBio-Q scores in the pre-operative ($p=0.547$) or 1 month post-activation ($p=0.179$) testing periods. However, when examining the relationship between total scaled MoCA score to AzBio-Q scores, we discovered a trend towards correlation ($r: 0.454, p = 0.067$, data not shown).

Discussion

Pre-operative MoCA-HI scores were not associated with post-implantation speech recognition performance in the early activation period. Additionally, post-implantation speech recognition outcomes were not statistically different between recipients with normal vs. abnormal MoCA-HI scores. These preliminary findings suggest that pre-operative performance on the MoCA-HI should not be used to predict post-implantation outcomes as post-operative performance in recipients with abnormal MoCA-HI scores perform as well as their peers with normal MoCA-HI scores. The results of the present study corroborate previously described studies in the literature.^{3,7} While MoCA-HI scores may not strongly predict post-operative patient performance, they may be useful in counseling and optimizing auxiliary patient outcomes. For example, practices such as referring patients with abnormal MoCA-HI scores for additional cognitive evaluation may help optimize family support and setting expectations for aural rehabilitation after implantation. Our study is limited by sample size, and more patients may be assessed with the development of a MoCA-HI for native Spanish speakers. Additional data may help elucidate other relationships between cognition and post-operative cochlear implant outcomes.

Conclusions

Pre-operative MoCA-HI scores were not predictive of post-implantation speech recognition outcomes. Instead, the MoCA-HI is a tool clinicians may use to set expectations and make appropriate referrals to facilitate patient success.

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