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**PREDICTIVE FACTORS OF COCHLEAR IMPLANT OUTCOMES: THE ROLE OF AGE, DURATION OF DEAFNESS AND SPEECH RECOGNITION BASELINE**

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**Background:**

Cochlear implantation is a well-established intervention for patients with severe-to-profound hearing loss. Despite its proven benefits, patient outcomes remain highly variable. Previous studies have identified several potential prognostic indicators, including age at implantation, duration of deafness, and baseline speech perception. However, disentangling the effects of these interrelated variables remains a challenge, particularly in post-lingually deafened adults.

**Objective:**

To examine the influence of age at cochlear implantation, duration of deafness, and preoperative speech perception on auditory outcomes one year post-activation, and to explore the existence of patients with discordant outcomes relative to predicted prognosis ("outliers").

**Setting:**

This study was conducted at the Unidade Local de Saúde de Coimbra in collaboration with the Faculty of Medicine of the University of Coimbra.

**Design:**

Retrospective multicenter observational cohort study.

**Population:**

Adult patients ( $\geq 18$  years) with bilateral, post-lingual, sensorineural hearing loss who received a cochlear implant between 2018 and 2023. All patients had at least 12 months of follow-up post-activation. Patients with incomplete data or follow-up were excluded.

**Method:**

Participants were grouped according to type and severity of hearing loss. Speech perception was assessed using the Portuguese version of a disyllabic word recognition test. The primary variables examined were age at implantation, duration of deafness, and preoperative CID sentence recognition scores. Bivariate and multivariate linear regression analyses were conducted to assess associations with post-implantation performance, adjusting for potential confounders such as age at hearing loss onset ( $< 18$  vs.  $\geq 18$  years).

**Results:**

Among the cohort, preoperative CID scores were significantly correlated with post-implantation speech recognition outcomes ( $p < 0.01$ ), whereas age at implantation and duration of deafness alone did not reach statistical significance ( $p > 0.05$ ). However, subgroup analysis revealed that some older patients with residual auditory capacity and well-developed linguistic skills performed unexpectedly well. Conversely, a small number of younger adults with early-onset hearing loss exhibited poorer-than-expected outcomes, suggesting additional cognitive or neurodevelopmental influences.

**Conclusions:**

Our findings confirm that while traditional clinical variables such as age and deafness duration are important, baseline speech perception remains the most reliable predictor of cochlear implant performance. The presence of outlier profiles highlights the need to consider individual cognitive and linguistic backgrounds when counseling candidates and interpreting results. These insights

may also inform future genetic or neurocognitive research aimed at optimizing patient selection and rehabilitation.