Cochlear implant outcomes in patients with Meniere’s disease: What do the impedances tell us?

C.T. Forde¹, H. Kanona¹, A. Van Rooyen¹, P. Keating², J. Bradley¹ and A. Shaida¹

¹. The Royal National Ear, Nose & Throat Hospital, University College Hospitals, London
². University College London Ear Institute

INTRODUCTION

Patients with Meniere’s Disease (MD) undergoing cochlear implantation require more intensive auditory rehabilitation. There is, however, little evidence in the literature explaining why this may be the case.

To explore this further, a retrospective case series review was originally undertaken by our team¹, and our results demonstrated that 45% of patients with active MD pre-implantation continued to have active Meniere’s disease post-operatively, while zero patients from the pre-operative inactive MD group had active Meniere’s disease post-operatively (p=0.027).

Patients with active Meniere’s disease following implantation required significantly more visits to the audiology department compared to controls due to ongoing auditory fluctuations with reported increases in electrode impedance (figure below). It was previously hypothesised that the variability of impedances in active MD ears was similar to that found in the hearing fluctuation synonymous with the disease².

We aimed to investigate this further using our large cohort of implanted MD patients.

METHODS

A retrospective case review of patients with MD undergoing CI at a tertiary referral centre was performed using electronic/paper records and departmental database.

All patients were matched with a control for age, gender, implant manufacturer and electrode design (1:1 ratio). Impedance data for both groups were analysed following the first 28 days to minimise the effects of impedance variability directly related to surgery³,⁴. Due to variability in baseline impedances across manufacturers, data from the same manufacturer were also matched.

Impedance variability (specifically the standard deviation) were measured over time for each electrode in a similar fashion to that done by McNeill & Eykamp⁵ where the primary finding of this study was that there was a significant difference in the stability of electrode impedances in a MD compared with a non-MD ear within the same subject.

Figures and graphs were created to explore electrode variability over time and statistical analysis performed with a parametric T-test.

RESULTS

Forty patients met the study inclusion criteria and were implanted between May 1993 and May 2019. The mean age at implantation was 58 years old (26-94 years) and mean follow up was 6.5 years (6 months – 26 years). Of these, one patient was excluded due to variable implant use with sporadic impedance data, therefore a total of thirty-nine patients were analysed (17 Cochlear; 12 MED-EL; 10 Advanced Bionics).

Matched data from the same manufacturer demonstrated some significant differences in impedances between active and inactive MD patients at the same electrode in both Cochlear and MED-EL groups. The impedances of the inactive MD patients for both manufacturers matched the control group. No significant difference was demonstrated between active and inactive MD groups in the Advanced Bionics manufacturer group.

CONCLUSIONS

This is the largest reported global series measuring post-operative cochlear implant impedances in patients with MD. Although impedance data appear to vary across individuals, electrodes and manufacturers, the data suggest that impedances differ between active and inactive Meniere’s patients in at least some cases. In such cases, this appears to be because impedances in patients with active MD are more variable over time than those observed in those with inactive MD. However, this effect is more easily observed for some electrode manufacturers (and electrodes) than others. These results are broadly consistent with the only previous paper hypothesizing impedance fluctuance in MD patients.

Further analysis is currently being undertaken to assess the potential to pool impedance data across all manufacturers.

This early-stage work on impedances in MD patients may lead to significant improvements in programming strategies for those active MD patients with significant auditory fluctuations post-implantation.

REFERENCES