Canadian Audiologist

The Official Publication of the Canadian Academy of Audiology

Importance of Vestibular Testing in Cochlear Implant Assessments

Published July 1st, 2019

Myron Huen, MSc, RAUD, RHIP

St. Paul's Hospital, Department of Audiology

In this edition of "Striking the Right Balance," Audiologist Myron Huen from the Cochlear Implant team at St. Paul's Hospital, Vancouver, BC, shares her experience performing vestibular assessments in Cochlear Implant candidates.

Michael Vekasi, MClSc, R.Aud, Aud(C), FAAA and Erica Zaia, MSc, RAUD are coordinating the "Striking the Right Balance," feature which will cover the latest information on 'all things vestibular.'
If you would like to be more involved in all things vestibular, please sign-up for the Vestibular Special Interest Group. Sign-up by simply emailing ericazaia@hotmail.com to let us know you want to be a part. Also, check out our Facebook page for a free list of online vestibular resources at the CAA National Vestibular Special Interest Group page.

St. Paul's Hospital is home to the BC Adult Cochlear Implant (CI) clinic. Before proceeding with a CI, patients go through a rigorous assessment process to determine their audiological and medical candidacy. In many centers, the typical test battery includes pure-tone audiometry (air and bone conduction), otoacoustic emissions testing, immittance testing, word recognition testing and sentence recognition testing (with insert earphones as well as the patients' best-aided condition). Electrophysiological testing, such as auditory brainstem response testing or slow cortical potential testing, may also be performed when there are concerns with neural synchrony or reliability of pure tone behavioural thresholds. The CI assessment also includes an appointment with our program's social worker. This is particularly important for setting realistic expectations, reiterating some information already shared at the end of their audiological assessment and if their emotional and/or financial support is vulnerable.

Over the past year and a half, we began incorporating the Video Head Impulse Test (VHIT) as a standard part of our cochlear implant test battery. Vestibular dysfunction is a risk of CI surgery; there have been several suggested mechanisms as to why a decrease in function occurs, including direct trauma caused by electrode insertion, acute serous labyrinthitis due to cochleostomy, a reaction to a foreign body leading to labyrinthitis, endolymphatic hydrops, and the presence of electrical stimulation from the implant itself.[1]

In the past, vestibular testing was only done on a case-by-case basis based on the patient's reported history of dizziness. Although some short-term and/or mild dizziness is a common symptom post

cochlear implantation,[2] some patients have reported persisting dizziness and/or balance deficits subsequent to implantation. It was difficult to determine the etiology of dizziness in some of these cases as there were no pre-implantation results with which to compare. Consequently, whether the dizziness was associated with a decrease or further decrease of vestibular function that was uncompensated, or a decrease in function due to other contributors of balance, such as vision or proprioception, could not always be determined conclusively with these patients. Some patients may also have compensated for a sudden or gradual loss of vestibular function and therefore may not have reported dizziness symptoms prior to implantation. If a loss of function is introduced causing the vestibular weakness to be uncompensated, it can significantly affect the patient's day-to-day function and increase the risk of falls. As a team, we felt that it was important to assess the vestibular function of cochlear implant recipients in order to contribute to the consideration of side of implantation in cases of unilateral implantation; the majority of cochlear implant cases are unilateral in British Columbia. Should there be a need for further testing to determine residual vestibular function prior to implantation, Suppression Head Impulse Testing and caloric testing may also be performed. Last but not least, Positional testing may also be performed, before or after, in cases where benign paroxysmal positional vertigo may be indicated.

During a four-month pilot at St. Paul's Hospital, we monitored wait-list times for vestibular testing as well as outcomes as a result of VHIT testing on all patients having a cochlear implant assessment. Some of the patients assessed did not report any major vestibular episodes or major vestibular complaints; yet 1 out of the 18 recorded cases during this pilot showed reduced vestibular function bilaterally, as catch-up saccades were observed in both lateral canals, suggesting that this patient has at least been able to compensate and cope well enough using other modalities such as vision and proprioception. Since a disturbance to the compensated state could possibly lead to further issues with balance, with this added information, we were able to provide additional counseling and preventative advice to lower the risks of falls.

Since the pilot, we have also had at least one case where the VHIT results changed the ear recommended for implantation. For this particular patient, both ears met the traditional audiological implantation criteria, where the worse hearing ear was initially recommended for implantation. This was, however, also the better functional ear with regards to the vestibular system. In light of these results, the poorer vestibular ear and better hearing ear was instead recommended for implantation due to the risk of causing bilateral vestibular dysfunction with the original ear recommended for implantation.

As new cochlear implant patients are already spending a great number of cognitive resources on their aural rehabilitation and adaptation to the use of the cochlear implant, it is our responsibility as their care providers to minimize the risks of vestibular dysfunction, which can further put a toll on their cognitive resources and affect their quality of life. It is, however, important to note that testing potential candidates presented with some challenges. Due to most of these patients' dependence on speechreading and the position of the examiner behind the patient to perform a VHIT, ongoing instructions during the test can be difficult. Some strategies we employ include use of prepared written instructions and pre-defined hand gestures for common instructions we have found the need to repeat for many patients while testing (e.g., "keep your eyes open", "relax your neck", "keep your eyes on the target"). Moreover, many of these patients are also older in age and tend to have stiffer necks, which can be problematic for obtaining usable recordings. Given the minimal effects on our wait-times for referrals for full vestibular testing, the increased chances of providing additional and necessary counseling on balance management, and an increased amount of clinical knowledge on each patient that can be used to help guide decisions, the St. Paul's team believes that including VHIT in our standard test battery has been an effective use of our clinical

time and resources while improving patient’s care.

Acknowledgements

Thank you to Anielle Lim Kee Chong (MSc, RAUD) for providing her input and edits to this article.

References

1. Ibrahim I, Daniela da Silva S, Segal B, and Zeitouni A. Effects of cochlear implant surgery on vestibular function: meta-analysis study. J Otolaryngol Head Neck Surg 2017;46, doi:10.1186/s40463-017-0224-0.
2. Zawawi F, Alobaid F, Leroux T, and Zeitouni A. Patients reported outcome post-cochlear implantation: how severe is their dizziness? J Otolaryngol Head Neck Surg 2014;43:doi: 10.1186/s40463-014-0049-z.