



**AALBORG UNIVERSITY**  
DENMARK

**Aalborg Universitet**

## **Commentary: The effect of cochlear implant surgery on vestibular function in adults: A meta-analysis study**

Kjærsgaard, Jonas Bruun

*Published in:*  
Frontiers in Neurology

*DOI (link to publication from Publisher):*  
[10.3389/fneur.2022.1060370](https://doi.org/10.3389/fneur.2022.1060370)

*Creative Commons License*  
CC BY 4.0

*Publication date:*  
2022

*Document Version*  
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*

Kjærsgaard, J. B. (2022). Commentary: The effect of cochlear implant surgery on vestibular function in adults: A meta-analysis study. *Frontiers in Neurology*, 13, Article 1060370. <https://doi.org/10.3389/fneur.2022.1060370>

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

### **Take down policy**

If you believe that this document breaches copyright please contact us at [vbn@aub.aau.dk](mailto:vbn@aub.aau.dk) providing details, and we will remove access to the work immediately and investigate your claim.



## OPEN ACCESS

## EDITED BY

Stefan K. Plontke,  
Martin Luther University of  
Halle-Wittenberg, Germany

## REVIEWED BY

Jennifer Spiegel,  
LMU Munich University  
Hospital, Germany  
Laura Fröhlich,  
University Hospital in Halle, Germany

## \*CORRESPONDENCE

Jonas Bruun Kjærsgaard  
jonas.kjaersgaard@rn.dk

## SPECIALTY SECTION

This article was submitted to  
Neuro-Otology,  
a section of the journal  
Frontiers in Neurology

RECEIVED 03 October 2022

ACCEPTED 24 October 2022

PUBLISHED 11 November 2022

## CITATION

Kjærsgaard JB (2022) Commentary:  
The effect of cochlear implant surgery  
on vestibular function in adults: A  
meta-analysis study.  
*Front. Neurol.* 13:1060370.  
doi: 10.3389/fneur.2022.1060370

## COPYRIGHT

© 2022 Kjærsgaard. This is an  
open-access article distributed under  
the terms of the [Creative Commons  
Attribution License \(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use,  
distribution or reproduction in other  
forums is permitted, provided the  
original author(s) and the copyright  
owner(s) are credited and that the  
original publication in this journal is  
cited, in accordance with accepted  
academic practice. No use, distribution  
or reproduction is permitted which  
does not comply with these terms.

# Commentary: The effect of cochlear implant surgery on vestibular function in adults: A meta-analysis study

Jonas Bruun Kjærsgaard<sup>1,2\*</sup>

<sup>1</sup>Balance & Dizziness Centre, Department of Otolaryngology, Head & Neck Surgery and Audiology, Aalborg University Hospital, Aalborg, Denmark, <sup>2</sup>Department of Clinical Medicine, Aalborg University, Aalborg, Denmark

## KEYWORDS

cervical vestibular evoked myogenic potential (cVEMP), video head impulse (vHIT), cochlear implant (CI), commentary, meta-analysis

## Introduction

A recent meta-analysis by Vaz et al. explored the vestibular function before and after cochlear implantation (CI) objectivated by cervical vestibular evoked myogenic potentials (cVEMP), the caloric test, head impulse test, and the video head impulse test (vHIT) (1). A specific commentary on their selected literature, data analysis, and the interpretation of cVEMP deserves to be put forward.

## Subsections relevant for the subject

Alterations of Vestibular Function in Cochlear Implantation.

## Discussion

Vaz et al. include data from the paper of both West et al. and Rasmussen et al. even though it is beyond doubt the same patients and preoperative outcomes that are being reported (2, 3). This would magnify the findings and uncertainty originating from a single sample, the opposite of the *raison d'être* of meta-analyses. Furthermore, Vaz et al. report the number of participants in the study of Rasmussen et al. to be 43, while the actual number being reported is 35 (3). This incongruence could perhaps stem from the specific identification number given to the last patient shown in their raw data report, but it is still incomprehensible how this misunderstanding was not corrected when doing the analysis, as Rasmussen et al. stated their sample size in multiple places in both text and figures. These eight extra patients in the meta-analysis were mistakenly added to the “normal” group for the vHIT examination, but for the cVEMP, they were grouped as “abnormal”. This bias would result in an underestimation of the absolute risk for abnormal vHIT and quite strongly overestimate the absolute risk for an abnormal cVEMP result. These mistakes could influence the overall credibility of the study.

Vaz et al. wisely reflect on the reliability of the cVEMP following CI. However, they do not fully encapsulate the complexity of abnormal cVEMP results and by which caution they should be interpreted, despite critical evidence mounting (4, 5). Some important points may be drawn directly from the raw datasets from Rasmussen et al. and Nordfalk et al., which exemplify the challenges of cVEMP usage when evaluating patients before and after CI (3, 6). Rasmussen et al. interestingly found in their repeated measures of the non-implanted ear a change from the first absent to present cVEMP response in 7 out of 35 patients (20%), demonstrating in a clinical setting a low grade of repeatability, even for the most extreme outcome of the test. It is obviously debatable to which extend this phenomenon is generalizable, but Rasmussen et al. is not the first study to report such findings (3, 7). The assessment of this phenomenon is hindered as cVEMP results are often only being reported for the implanted side and furthermore only by means of amplitude and latency. This obscures within subject results of uttermost clinical importance, such as how often a previous absent response may be elicited later in the same patient. Nordfalk et al. choose to examine the specific thresholds of cVEMP, which is seldomly seen as an outcome. In this manner, they provide valuable information as they found that amongst the ones with preserved cVEMP after CI the intensity needed to elicit a cVEMP increased in 13 out of 14 subjects (92.8%). This difference in thresholds could perhaps be explained by changes in inner and middle ear mechanics, independent of otolith function as Vaz et al. also briefly mentions (1, 8). If true, the consequence would be to increase the number of absent cVEMP responses non-attributable to

otolith damage and thus further challenge its applicability in a clinical setting.

## Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

## Acknowledgments

The author sincerely thanks Herman Kingma for his encouragement to write this Commentary. JK currently in a PhD-fellowship partly financed by William Demant Foundation.

## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

## References

- Vaz F, Petrus L, Martins W, Silva I, Lima J, Santos NM, et al. The effect of cochlear implant surgery on vestibular function in adults: A meta-analysis study. *Front Neurol.* (2022) 13:947589. doi: 10.3389/fneur.2022.947589
- West N, Tian L, Vang Petersen LK, Bille M, Klokke M, Cayé-Thomasen P. Objective vestibular test battery and patient reported outcomes in cochlear implant recipients. *Otol Neurotol.* (2021) 42:e416–24. doi: 10.1097/MAO.0000000000002959
- Rasmussen KMB, West N, Tian L, Cayé-Thomasen P. Long-term vestibular outcomes in cochlear implant recipients. *Front Neurol.* (2021) 12:686681. doi: 10.3389/fneur.2021.686681
- Piker EG, Riska K, Garrison D, Kaylie DM. Vestibular function after cochlear implantation: A test battery and case-by-case approach. *Laryngoscope Investig Otolaryngol.* (2020) 5:560–71. doi: 10.1002/liv.2413
- Piker EG, Baloh RW, Witsell DL, Garrison DB, Lee WT. Assessment of the clinical utility of cervical and ocular vestibular evoked myogenic potential testing in elderly patients. *Otol Neurotol.* (2015) 36:1238–44. doi: 10.1097/MAO.0000000000000793
- Nordfalk KF, Rasmussen K, Hopp E, Bunne M, Silvola JT, Jablonski GE. Insertion depth in cochlear implantation and outcome in residual hearing and vestibular function. *Ear Hear.* (2016) 37:e129–37. doi: 10.1097/AUD.0000000000000241
- Barbara M, Talamonti R, Benincasa AT, et al. Early assessment of vestibular function after unilateral cochlear implant surgery. *Audiol Neurotol.* (2020) 25:50–9. doi: 10.1159/000502252
- Merchant GR, Schulz KM, Patterson JN, Fitzpatrick D, Janky KL. Effect of cochlear implantation on vestibular evoked myogenic potentials and wideband acoustic immittance. *Ear Hear.* (2020) 41:1111–24. doi: 10.1097/AUD.0000000000000831