Author's response to reviews

Title: A Retrospective Study of Cochlear Implant Outcomes in Children with Residual Hearing

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Author's response to reviews: see over
We thank the peer reviewers for their helpful comments and have revised the manuscript accordingly.

Dr. Harrison’s comments were related to the literature review and the absence of a control group for this study. We re-visited the literature in this area and believe that given the paucity of research on the topic of children with residual hearing, our review includes an adequate summary of the existing body of evidence. We acknowledge and appreciate the comment regarding the stronger evidence that would have been provided by including a control group. As this was a retrospective study, similar data on a comparison group of children without cochlear implants was not available. We have, in fact, recently secured a grant through the Children’s Hospital of Eastern Ontario Research Institute to compare outcomes in children with residual hearing fitted with hearing aids with a group of children who use cochlear implants.

The revisions detailed below relate to Dr. Dowell’s report. The manuscript changes have in most cases been included in the response in italics.

1. On page 5, we have provided a rationale for the exclusion of children with auditory neuropathy and provided a reference from Rance et al., Ear & Hearing 2004 as follows:

   Children with a clinical diagnosis of auditory neuropathy were excluded due to the different audiologic profile which has been reported for this population. This includes great variability in behavioural audiometric thresholds and speech understanding skills that differ from children with comparable degrees of sensorineural hearing loss (19).

2. We have provided a more detailed explanation (page 5) of the lack of hearing aid use in this group of implanted children including a statement about the implant centre’s practice.

   At the time this group of children was implanted, the practice of the implant centre was to provide children the option of using bimodal stimulation (cochlear implant and hearing aid) based on the child’s perceptions of sound quality as well as parents’ and therapists’ clinical observations. Chart data indicated that 4 of the 10 children chose to continue using a hearing aid in the contralateral ear for periods ranging from 1 month to about 18 months. In all cases, hearing aid use was discontinued due to the child’s report of poor sound quality. Systematic speech perception testing was not conducted in the bimodal condition; therefore all results extracted for this study were obtained in a unilateral cochlear implant mode.

3. Pre-implant data were missing for two children, for one test score each, i.e. two data points. We have provided details (page 6) on the pre-implant functioning of these children and therefore the rationale for which the 0% open-set score decision was made. Pre-implant test scores were available for all but two children who could not complete open-set testing due to their limited speech recognition abilities. For the analysis, one child was assigned a score of 0% on the PBK, based on a measured score below chance.
on the Early Speech Perception (ESP), a pediatric closed-set test, which was administered in a monitored live voice mode. The second child was assigned a 0% score on the HINT-C test based on poor performance on the monitored live voice ESP test and a documented score of 0% for open-set words.

4. We found Dr. Dowell’s suggestion to apply the Thornton and Raffin (1978) binomial modeling concept to our data to be very useful. Following consultation with a biostatistician, we have described the significance of scores based on critical difference scores (page 7). We have also reported group scores as medians with their ranges and have revised Figure 4 (and the title for Figure 4) accordingly.

5. We are in agreement with the statement that the scores on sentence tests may be in part related to language growth rather than an improvement in auditory perceptual skills. We had attempted to capture this notion in the Discussion section, but have now further elaborated on this in the discussion including a reference to Blamey et al., JSLHR 2001 (pages 7-8).

However, as discussed by Blamey et al (14), caution must be exercised in drawing conclusions about the benefits of an intervention based on speech recognition scores as speech understanding, particularly for sentences, is not only affected by the individual’s auditory capacity but also depends on linguistic abilities. As with many other published cochlear implant outcome studies, in this retrospective study, it was not possible to account for this confounding factor. Retrospective data did not allow us to quantify the linguistic abilities of these children pre and post-implant or to isolate the impact of speech and language growth over time on their speech perception scores. However, the significant improvement in auditory capacity in such a short timeframe suggests that at least some of the gains were due to the cochlear implant intervention rather than to the progress that would have occurred in the course of rehabilitation with a conventional hearing aid. These children had several years of experience with conventional acoustic amplification and auditory-verbal rehabilitation prior to cochlear implantation and were implanted based on the best clinical judgment that their auditory skills had reached a plateau with hearing aids.

6. As suggested, we have replaced the term “markedly improved” with “statistically significant”

Thank you for the input you have provided. We believe that it has strengthened the manuscript and look forward to your review of the revised manuscript.

Elizabeth Fitzpatrick