Author's response to reviews

Title: Comparison of the benefits of cochlear implantation versus contra-lateral routing of signal hearing aids in adult patients with single-sided deafness: study protocol for a prospective within-subject longitudinal trial

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To the editor,

Please find enclosed a revised manuscript reporting the protocol for our clinical trial entitled “Comparison of the benefits of cochlear implantation versus contra-lateral routing of signal hearing aids in adult patients with single-sided deafness: study protocol for a prospective within-subject longitudinal trial”. We have revised the manuscript to address the additional requests of the anonymous reviewer. Each of the requests is listed below with our response in italic font.

**Reviewer 1**

1. The biggest concern I still have is the evaluation time after cochlear implantation. They say the follow-up period will be 9 months. There have been several groups who have reported (unfortunately not published yet) that development of these binaural benefits take a lot longer to develop in these SSD patients than in "regular" bimodal/bilateral CI-patients. So I am not entirely sure if 9 months is going to be enough. On the other hand, I do understand that this is a study designed to weigh the advantages of CI in SSD compared to CROS, to convince the NHS, so you can't wait forever.

The length of the follow-up period (9 months) was chosen based on existing evidence to be sufficient to detect whether or not there is a significant benefit to localisation from cochlear implantation (in line with our stated objectives and analysis plan). We certainly agree that 9 months would be insufficient if the goal was to determine what the maximum benefit to localisation may be, and that benefits from CI in patients with SSD are likely to continue to emerge over a longer period of time as is the case with CI in bilaterally-deaf recipients. However, minimising the length of the follow-up period to address the specific questions being asked by this study is both (a) of practical importance as replacing participants who drop out at a late stage would be both costly and delay study completion significantly; and (b) of ethical importance as we are under a duty to only burden participants with study visits/activities which are necessary to address the stated aims of the research.

We have revised the justification for the length of the CI follow-up period ('Methods/Design', paragraph 2) to clarify not only that the majority of benefits from CI in traditional candidates emerge within 9 months but also that there is existing evidence that significant improvements in sound localisation (our primary outcome measure) in patients with SSD have been observed after a follow-up period of only 6 months, as follows:

“The duration of the cochlear implantation follow-up period (9 months) was chosen based on data from previous studies which have observed that (a) a large proportion of the benefit from cochlear implantation is achieved within the first 9 months and additional benefits emerge at a slower rate over the course of several years (Tyler et al, Ruffin et al); and (b) significant benefits to binaural hearing from cochlear implantation in patients with SSD can be achieved as early as 6 months after implantation (Arndt et al.).”

2. So if I get it correct, only those patients showing no benefit for CROS will be considered for implantation? That wasn't clear from the paper.
Only those patients who report receiving insufficient benefit from a CROS will be offered the opportunity to receive a cochlear implant. We endeavoured to communicate this important point both in the abstract and also at numerous points in paper, including: (a) a full paragraph at the end of the ‘Introduction’ section which is dedicated to this specific design decision and provides a justification based on the context of the study (the UK National Health Service); (b) the stated purpose for the study (‘Purpose’ section) which clarifies that benefits from CI will be evaluated only in those ‘who have failed to receive sufficient benefit from [a CROS]’; and (c) the second paragraph of the ‘Discussion’ section which re-iterates the justification that it is those patients who do not benefit from CROS who have no other treatment options available to them and therefore for whom CI might be provided in the UK.

However, we are still concerned that this point was not sufficiently clear to the reviewer and may not therefore be clear to readers of the journal. We have therefore also modified the study objectives to include the words ‘in patients who report insufficient benefit from a CROS’, as follows:

“Primary objectives
- Does a cochlear implant significantly improve sound localisation compared to a CROS hearing aid in patients who report insufficient benefit from a CROS?
- Does a cochlear implant significantly improve speech perception in noise compared to a CROS hearing aid in patients who report insufficient benefit from a CROS?

Secondary objective
- Does a cochlear implant significantly improve quality of life compared to a CROS hearing aid in patients who report insufficient benefit from a CROS?”

Thank you for considering our manuscript for publication.

Yours sincerely,
On behalf of my fellow authors,

Dr Pádraig Kitterick