

Background

- Bilateral Cochlear Implants (CI), although a standard of care when indicated, may not always be feasible due to multiple reasons. For individuals with aidable hearing in the non-CI ear, use of a hearing aid (HA; bimodal hearing) can be beneficial. For individuals with no aidable hearing in the non-CI ear, a CROS can be of benefit.
- For individuals who have **'limited aidable hearing'** in the contralateral ear and are not considering a second CI, the audiogram is not a sole, reliable indicator of whether an individual will benefit more from a CROS or if they should continue using a HA.

A test battery approach is needed:

- Objective assessments (e.g., audiogram, speech scores in noise, sound source lateralization, etc.)
- Subjective assessments (e.g., survey of baseline listening needs, real-world feedback based on chronic trial with HA and CROS, etc.)

Study Objective

To identify clinical guidelines for assessing which device may be of more benefit, a hearing aid (HA) or a CROS, for unilateral cochlear implant (CI) recipients who have limited bimodal benefit and are unwilling or unable to get a second CI.

Study Hypotheses

We hypothesize that subjects will benefit more from a CROS device when exhibiting the following:

- Fewer aidable frequencies (audiogram)
- Little or no bimodal benefit (speech scores, qualitative)
- Poorer bimodal lateralization
- Difficulty understanding speech from non-CI ear side

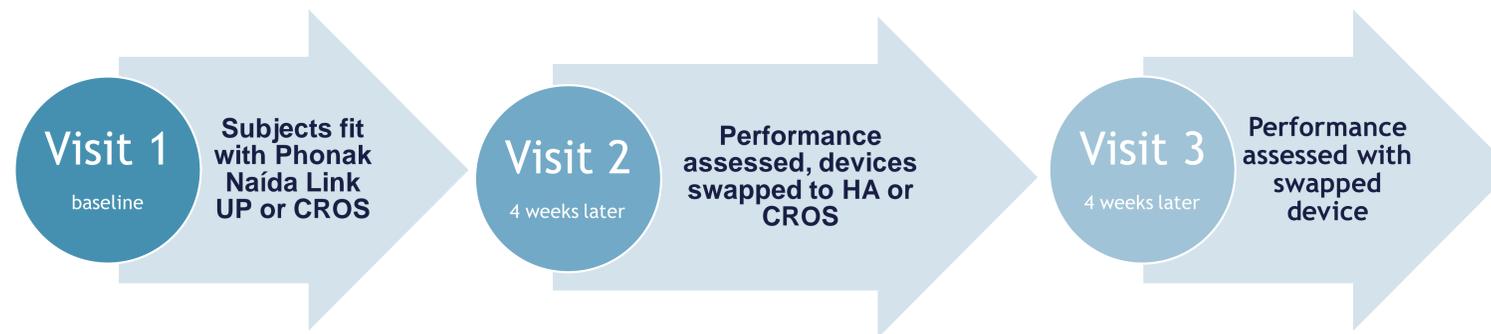
Study Participants

18 adult CI recipients, average age 75 years (51 – 81 yrs) Unilateral Advanced Bionics CI (CII or later) Average duration of CI experience 3.5 years (1 – 17 yrs)

- Everyday listening configuration prior to study:
 - Fifteen participants: CI+HA
 - Two participants: CI+CROS
 - One participant: Unilateral CI only

Test Measures and Outcomes

Three study visits assessing subjects' performance and preference of HA and CROS.

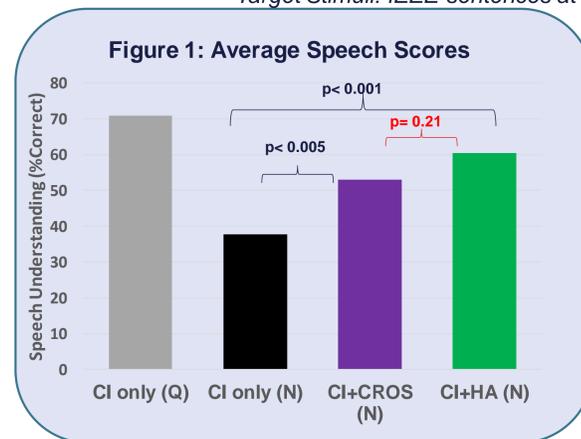


The following were assessed:

Pure Tone Audiometry | Speech Understanding in Quiet and in Noise | Sound-source lateralization
Subject Preferences via Questionnaires

Speech Scores & Lateralization

Target Stimuli: IEEE sentences at 60 dBA | Noise: Two-talker babble at an individualized SNR | S_0N_0



Speech understanding in noise was significantly higher with a contralateral device than with a CI only

Average CI+HA scores tended to be greater than CI+CROS scores, though this did not reach statistical significance

Non-CI Ear Sound Lateralization:

CI only: 30% correct | CI + CROS: 40% Correct | CI + HA: 90% Correct

Lateralization via 3 sec pink noise stimulus at 60 dB SPL \pm 5 dB rove. Participants positioned at \pm 60 degrees azimuth from left and right speakers.

Non-CI ear lateralization accuracy was higher with HA than with CROS

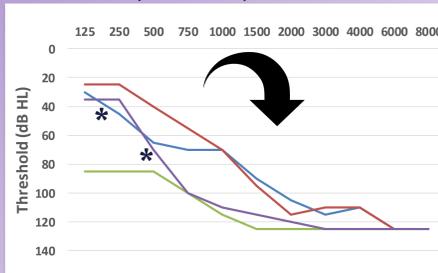
Which subjects demonstrate higher speech understanding from a CROS or an HA?

Higher CROS Benefit Group: Participants with more steeply sloping hearing loss

Higher HA Benefit Group: Participants with more aidable frequencies

Higher CROS Benefit Group

CROS benefit- HA benefit >10% in noise

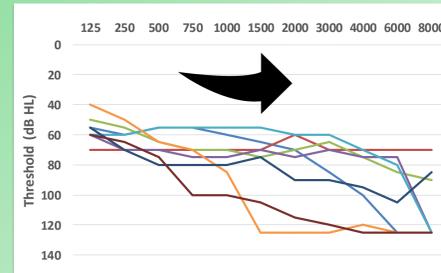


4 Subjects

Average benefit difference: 23.13%

Higher HA Benefit Group

HA benefit- CROS benefit >10% in noise



8 Subjects

Average benefit difference: 29.88%

Equivalent Benefit Group

HA benefit- CROS benefit \leq 10%



6 Subjects

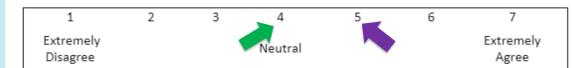
Average benefit difference: 3.75%

Subjective Feedback

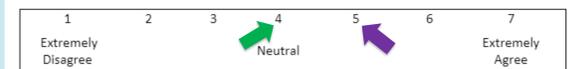
Both Chronic CROS and HA questionnaires yielded overall mean positive responses for each question, consistent with improved speech understanding in noise when utilizing either contralateral device.

On average, the **Higher CROS Benefit Group** rated their Chronic CROS experience as more positive compared to the **Higher HA Benefit Group**

3. The CROS device helped me hear family/friends around the dinner table.

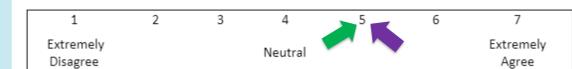


5. The CROS device helped me hear other people in a large group.



On average, the **Higher HA Benefit Group** AND the **Higher CROS Benefit Group** had a similarly positive rating for their chronic HA experience

5. The hearing aid helped me hear other people in a large group.



At the conclusion of the study:

15/18 participants preferred the HA device
3/18 participants preferred the CROS device:
*denoted by asterisk

Observations & Conclusions

Speech understanding in noise was significantly higher with the addition of a contralateral device

No significant difference for CROS versus HA speech scores

Non-CI side lateralization accuracy was highest in the CI + HA condition

CI+CROS : 40% correct versus CI+HA: 90% correct

15/18 participants preferred the HA at the conclusion of the study

Only 8/18 subjects had a higher HA benefit for speech in noise, suggesting that overall device preference was dependent upon additional factors like subjectively perceived benefit and non-CI side lateralization accuracy

Further multi-variate analysis is necessary

Having just finished data collection, this poster is the first pass at preliminary data analysis with a limited sample size.