Improved Quality of Hearing after Cochlear Implantation in Children with Unilateral Sensory Hearing Loss

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Disclosures

• MEDEL – SAB, Research support
• CI for SSD off-label, currently performed under FDA IDE
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Rationale for Consideration of CI in SSD

• Localization
• Speech in noise
• Auditory effort
• Fatigue
Pediatric Unilateral Hearing Loss (PUHL)

• Children with Unilateral Hearing loss have impaired understanding in noise (Bess et al 1986, Bess and Tharpe 1988, Lieu et al 2013, Reeder et al 2015).

• Children require a higher SNR than adults for speech recognition (Corbin et al 2016) and are constantly learning in a noisy environment.
Lack of binaural input impacts quality of life (QoL)

- Compromised educational outcomes
  - 22-35% of children with UHL repeat a grade
  - 12-41% require additional educational support (Lieu et al 2010)
- Greater communication difficulties reported on QoL measures (Reeder et al 2015)
- Fatigue?

Hornsby et al 2014
Pediatric Unilateral Hearing Loss (PUHL) Study

- Children age 3.5-6.5 years
- Typically developing
- PTA of ≥ 70 dB HL in one ear and normal hearing in the contralateral ear
- Aided CNC word score of ≤ 30% in the ear to be implanted
- No evidence of cochlear nerve deficiency (CND)
- No evidence of ossification
- No significant malformations
- English is the primary language

Not FDA approved. Investigational Device Exemption
Natural Place-Pitch Matching Critical for SSD

• Adult SSD data demonstrated early synergy between cochlear implant ear and contralateral acoustic hearing ear with long electrode

• Therefore selected longer MEDEL electrode except in cases of Mondini malformation
Test Battery

• Speech Perception
  • Early Speech Perception (ESP-S) and CNC Testing
    • Aided with the contralateral ear masked
    • Normal Hearing Ear alone
    • CI only via direct connect

CNC Word Scores

% Correct

Pre-Op (HA)  3-months  6-months  9-months  12-months  18-months  CI Mean  Nml Ear Pre  Nml Ear 12-Months

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BKB-SIN at 6 Months (n=8)

BKB-SIN 6 Mos

BKB-SIN 12 Mos

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Localization Results
What About Subjective Benefit?

Test Battery

• QoL
  • Peds-QL (parent and child)
    • Measures general, cognitive, and sleep fatigue
  • SSQ for Children with Impaired Hearing
    • Measures perception of speech understanding, spatial hearing, and quality of sound
  • Bern Benefit in Single Sided Deafness Questionnaire
    • Compares perception of hearing with and without a hearing device
    • Modified for children with the permission of Dr. Kompis

Not FDA approved. Investigational Device Exemption
Bern Benefit Inventory
SSQ – Speech, Spatial and Quality of Hearing
Effect on Auditory Effort and Fatigue

**Listening Effort**

- Mean Score
- Time Point: Pre-Op, 3 Mo, 6 Mo, 9 Mo, 12 Mo, 18 Mo

**Fatigue Score**

- General, Sleep, Cognitive
- Time Points: Pre-Op, 3 Mo, 6 Mo, 9 Mo, 12 Mo, 18 Mo

*Peds QL – Child Perception*
Conclusions

• In Children Undergoing CI for SSD
  • Improved speech reception in quiet and noise with cochlear implant for SSD in young children
  • Markedly improved localization
  • Improved subjective perception of hearing
  • Reduced fatigue potentially secondary to reduced listening effort
Impact on Kids

The Best Part of Me

IS MY ears. MY ears has been

insurgery. They help me when I

mentally listen. The help me do

base hearing and the ossi

help me live in school to my

friends to. I love my ears. The end
Thank you

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