Evidence-based guidelines for the provision and timing of cochlear implantation for young children

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Disclosures

• Dr Jaime Leigh
  • None

• Dr Shani Dettman
  • Grant/research support from Cochlear Ltd
  • University of Melbourne department received project-based grant funding

• Prof. Richard Dowell
  • Grant/research support from Cochlear Ltd
  • University of Melbourne department received project-based grant funding

• Unlabelled use of commercial product
  • Nucleus CI, use for children younger than 12 months of age
Aims & Method

• Which children with hearing loss should receive a CI?
  • Compare speech perception performance of children using CIs (n=78) to those using HAs (n=62) with varying degrees of hearing loss
  • Determine the degree of hearing loss in which a child is likely to benefit from a CI
  • Provide evidence-based pure-tone average guideline for the ear to be implanted

• What is the optimal age to receive a CI?
  • Language of 32 children who received a CI before 2.5 years of age was assessed over six years
  • Investigate the relevance of age at implantation along with other co-variates
Distribution of speech perception scores for children using CI

Monosyllabic word test, presented audition alone

<table>
<thead>
<tr>
<th>Word score</th>
<th>Phoneme score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st quartile (41%)</td>
<td>1st quartile (73%)</td>
</tr>
<tr>
<td>Median (57%)</td>
<td>Median (83%)</td>
</tr>
</tbody>
</table>

Percentage correct (%)  

Frequency

n = 78
Comparison between children using CI and HAs
Relationship between phoneme score and PTA for HA users

Monosyllabic word test, presented audition alone

OSWph = 68.6 + 0.639 PTA - 0.00940 PTA^2
Deriving equivalent hearing loss for children using CI

Monosyllabic word test, presented audition alone

Percentage correct (%) vs. 3-frequency PTA (dB HL)

OSWph = 68.6 + 0.639 PTA - 0.00940 PTA^2

CI first quartile (73%)
More conservative guidelines available

<table>
<thead>
<tr>
<th>Percentage of CI children exceeding score</th>
<th>Phoneme score (%)</th>
<th>Equivalent hearing loss (dBHL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75%</td>
<td>73</td>
<td>60</td>
</tr>
<tr>
<td>80%</td>
<td>69</td>
<td>67</td>
</tr>
<tr>
<td>85%</td>
<td>65</td>
<td>73</td>
</tr>
<tr>
<td>90%</td>
<td>61</td>
<td>78</td>
</tr>
<tr>
<td>95%</td>
<td>58</td>
<td>82</td>
</tr>
</tbody>
</table>
Audiological guidelines for recommending CI

- Confidently recommend CI if PTA is >85dB
- If PTA is in the range of 65-80dB CI can be recommended provided that 75% chance of improvement is acceptable to the family
  - oral language skills can assist with decision making
- If PTA better than 65dB the family should be encouraged to continue with HA use
- Configuration of the hearing loss should always be considered
Optimal age at implantation

Language comprehension growth rates as measured on the RI-TLS & PPVT

n=32
CI<2.5 years
No additional disability
Mean rate of growth 1.04 (range 0.73-1.52)
Optimal age at implantation

67% of the variance in the estimated age oral language began developing was explained by age at CI
Conclusion

• Hearing-impaired children under three years of age may benefit from cochlear implantation if their PTA exceeds 60 dB HL bilaterally
  • provided 75% chance of benefit is acceptable to the family
• Implantation as young as possible should minimise any language delay resulting from an initial period of auditory deprivation
• Challenge now is how we appropriately assess these infants and ensure we make timely recommendations
For further information

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• Reference: