Long Term Cognitive Skills and Auditory Function In Elderly Cochlear Implant Recipients

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Disclosures

• Cochlear: Surgical Advisory Board
• Medtronic: Consultant
Hearing Loss in the Elderly

• Third Most Common Chronic Condition
• >1,000,000 Potential CI Candidates in US
• World of Silence: Physical, Psychological and Social Effects
• Depression
• Decrease in Well Being
Risk-Benefit Ratio
Elective Surgery in the Elderly

- Nature and Prognosis of Surgery
- Diagnosis and Comorbidities
- Patient Desires
- Predicted Longevity vs. Probability of Substantial Morbidity/Mortality
Cochlear Implantation in the Elderly

Concerns

• Risks of surgery outweigh benefits
• Elderly patients are too old to learn
• Older patients will have limited improvement in auditory rehabilitation
Rehabilitation Concerns

• Age Related Degeneration of Spiral Ganglion Cells
• Central Presbycusis
  Deficits in Central Auditory Pathways
• General Cognitive Deficits in Elderly
Current Medicare Criteria for Cochlear Implantation
April 4, 2005

• Pre or Postlingually deafened
• Moderate to Profound SNHL
• Limited Benefit From Amplification
  <40% correct in best aided conditions of open set sentences
• Cognitive Ability to Use Auditory Cues
• Willingness to Undergo Extensive Rehabilitation
Cognitive Testing

- Mood / Affect
- Thought Process
- Appearance
- Attitude
- Memory
- Orientation
Tests of Cognition

• General Practitioner Assessment of Cognition (GPCOG)
• Hodkinson Abreviated Mental Test Score (AMTS)
• Mini-Mental State Examination (MMSE)
Mini-Mental State Exam
Folstein Test

• 30 Point Questionnaire
• 10 Minute Test
• Arithmetic
• Memory
• Orientation
## Interpretation of MMSE Scores

<table>
<thead>
<tr>
<th>Score</th>
<th>Degree of Impairment</th>
<th>Formal Psychometric Assessment</th>
<th>Day-to-Day Functioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-30</td>
<td>Questionable Significant</td>
<td>If clinical signs of cognitive impairment are present, formal assessment of cognition may be valuable.</td>
<td>May have clinically significant but mild deficits. Likely to affect only most demanding activities of daily living.</td>
</tr>
<tr>
<td>20-25</td>
<td>Mild</td>
<td>Formal assessment may be helpful to better determine pattern and extent of deficits.</td>
<td>Significant effect. May require some supervision, support and assistance.</td>
</tr>
<tr>
<td>10-20</td>
<td>Moderate</td>
<td>Formal assessment may be helpful if there are specific clinical indications.</td>
<td>Clear impairment. May require 24-hour supervision.</td>
</tr>
<tr>
<td>0-10</td>
<td>Severe</td>
<td>Patient not likely to be testable.</td>
<td>Marked impairment. Likely to require 24-hour supervision and assistance with ADL.</td>
</tr>
<tr>
<td>Max. Score</td>
<td>Pt. Score</td>
<td>Question</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-----------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>“What is the year? Season? Date? Day? Month?”</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>“Where are we now? State? County? City? Hospital? Floor?”</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>The examiner names 3 unrelated objects, then asks the pt. to repeat. The examiner repeats them all until pt. learns them all, if possible.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>“I would like you to count backwards from 100 by sevens/” (5 times). Alternative: Spell WORLD backwards.”</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>“Earlier I told you to name 3 things. Can you tell me what those are?”</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Show the patient 2 simple objects (pen, wristwatch), and ask them to name them.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>“Repeat the phrase: ‘No ifs, ands or buts.’”</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>“Take this paper in your right hand, fold it in half and put it on the floor.”</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>“Please read and do what this says.” (Written instructions “Close your eyes.”)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>“Make up and write a sentence about anything.” (Must contain a noun and a verb.)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>“Please copy this picture.” (Pt. shown picture of two intersecting pentagons.)</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>TOTAL</td>
<td></td>
</tr>
</tbody>
</table>
• Advantage
  Quick
  Easy To Perform

• Disadvantage
  Not Designed For Hearing Impaired
Current Study Group

- 37 Patients
- Age \( \geq 75 \) at time of implantation
- \( \geq 5 \) year follow up
Preoperative Status

• Mean MMSE Score: 28.8 (25-30)

• Sentence Score: 7.0%
>5 Years Post Implantation

- Mean MMSE Score: 27.3 (19-30)
  10 stable, 2 improved, 25 decreased

- Mean Sentence Score > 5 yrs: 79.4%
  Sentence Score 6 months: 60.1%
  Sentence Score 12 months: 64.9%
Stable Cognition

MMSE 26-30

• Preoperative MMSE: 26-30 (30 patients)

• Preoperative Sentence Score: 6.4%

• 5 Year Post-op Sentence Score: 85.9%
  6 Month Post-op Sentence Score: 64.8%
  12 Month Post-op Sentence Score: 72.1%
Stable Cognition 26-30 (30)

Sentence Score %

Subject

Pre-op Sent Score

> 5 Year Sent Score

The Center for Hearing and Balance Disorders
Poor Cognition

MMSE <25

• Preoperative MMSE: 25-30 (7 patients)

• Preoperative Sentence Score: 9.6%

• 5 year Post-op Sentence Score: 51.6% (13-83)

  6 Month Post-op Sentence Score: 38.0%

  12 Month Post-op Sentence Score: 38.9%
Poor Cognition MMSE ≤ 25 (7)
Cognition and CI Outcome

- Improved Overall Outcome with Higher Cognition Score
- Lower Cognition Scores Suggest Possibility of Poorer Performance
- Lower Cognition Score Does Not Preclude Improved Performance
Long Term Outcomes In Elderly

- Overall Function Typically Preserved
- In Spite of Decreased Function, Device Use Is Maintained / Eyeglasses
Long Term Cognitive Function

• Cognitive Function May Decrease in Spite of Cochlear Implantation
• Preservation of Cognition Typically Allows for Preserved Cochlear Implant Performance
• Decrease in Cognition May Result in Poorer Cochlear Implant Performance, but not in all Situations
Cognition in Elderly

• Does Prolonged Deafness Result in Scores Suggestive of Dementia?
• Can Cochlear Implantation Improve Cognition?
• Does Cochlear Implantation Preserve Long Term Cognitive Skills?
Conclusion

• Medicare May Restrict Eligibility for Cochlear Implantation
• Continued Demonstration of Improved Outcome and Effectiveness in Elderly Cochlear Implant Recipients Regardless of Age or Decreasing Mental Capacity
• Improved QALY
• ? Improved Cognitive Testing for Hearing Impaired