Statistical results of the cochlear implant case study using a database application software

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Outline

- Aim of the study
- Introduction of the CI software
- Material and methods
- Statistical results
- Discussion and conclusion
Aim of the study

- Using the CI database application software and SPSS to process cochlear implanted patients’ data, in order to know what factors influence the cochlear implant effects.
Introduction of the CI software

- We have developed a database application software to manage patients’ data with a cochlear implant.
- The aim of the software is to help the decision-making for a cochlear implant, to develop a better pre-operative procedures that can predict how well a patient will perform with a cochlear implant, and also to reach a level by future research that will enable all implant patients to be "better-performing" patients.
Function modules Of the software
### User Interface for Hearing Level Assessment

#### Hearing Check

<table>
<thead>
<tr>
<th>Ear Type</th>
<th>Frequency</th>
<th>Left Ear</th>
<th>Right Ear</th>
<th>Median</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Conduction</td>
<td>250Hz</td>
<td>1050</td>
<td>100</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Air Conduction</td>
<td>500Hz</td>
<td>1200</td>
<td>105</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Air Conduction</td>
<td>1kHz</td>
<td>1200</td>
<td>105</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Bone Conduction</td>
<td>250Hz</td>
<td>1050</td>
<td>100</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Bone Conduction</td>
<td>500Hz</td>
<td>1200</td>
<td>105</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Bone Conduction</td>
<td>1kHz</td>
<td>1200</td>
<td>105</td>
<td>1200</td>
<td>1200</td>
</tr>
</tbody>
</table>

#### Additional Features

- Record Retrieval
- Code Retrieval
- Name Retrieval

**User Information**

- Code: 000001
- Name: 余丝丝
- Record No: 420507
- Test Date: 2001-4-17

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**Note:**

The table above displays the hearing level assessment results for both air and bone conduction at various frequencies. The results show a consistent pattern across different ear types and frequencies, indicating normal hearing levels.
User interface for speech perception ability test
Material and methods

- **Software tool:** CI database application software
- **Questionnaire investigates**
  - Patient basic information
  - Ability of lip reading
  - Communions ability
  - Communion method
  - How satisfied by their parent
  - Where they go after CI operation
Material and methods

Subjects

- 100 pre-lingual deaf adolescent who underwent cochlear implant in Beijing TongRen Hospital during the years 1997~2004
- Average age is 13 years old
- CI usage time was from 6 months to 8 years
- Insisted to use CI everyday
Material and methods

- **Data records:** Patient data and the questionnaire investigation results were input to the software.

- **Statistics analysis:** Make use of the statistics function module in the software, convert each data item which related with the statistic study to a text file formatted as a SPSS input file. Use SPSS11.5 to do data statistics and analyse.
Statistical results

- Communion ability after using CI
  - 63% parents thought that their children can make simple communion.
  - 8% parents thought that their children can attain normal communions basically.
  - All quizee expressed that the patients still rely on the help of lip-reading and can't attain normal person's level.
Changes of communion method

- Before accepting CI, 67% patients used lip-reading to communicate, the rest adopted hand language.
- After using CI, 98% patients used lip-reading, and 22% use listening and speaking as a main communion method, another 2% patients still mainly used hand language.
Changes of communication method

- 98% patients had improved their ability of lip-reading. There is significant difference between ability points before and after using CI (p<0.01).

The distribution of the lip-reading ability

<table>
<thead>
<tr>
<th>Patient Number</th>
<th>before</th>
<th>after</th>
</tr>
</thead>
<tbody>
<tr>
<td>patient number</td>
<td>bad</td>
<td>little good</td>
</tr>
<tr>
<td>number</td>
<td>23</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>38</td>
</tr>
</tbody>
</table>

The distribution of the lip-reading ability
Approval of comprehension ability

- 58% parents thought that their children got more assistance in understanding environmental sounds than understanding speech by using CI.
- The ability of distinguishing 10 kinds of environment sounds is divided into 5 grades, including telephone bell ring, knock on a door, car hoot, etc. One point means never recognized, 5 point means always recognized. 36% patients got full points of the 10 items.
Using of CI

- 96% patients could insist to use CI over 10 hours everyday, 4% patients used CI 2~9 hours per day because of noisy feeling, psychological stress etc.
- 36% patients could use telephone, but feel difficult to understand.
- 49% patients had been used to watch TV with CI, but need help of reading screen caption to understand the conversation content.
Patients’ psychology

- 13% parents said that as age increased, their children had increasingly psychological stress. They did not like to communicate with other people, consequently they did not like to use CI to learn speaking.
- 12% parents thinking that their children would like to communicate with others, and thought themselves are just like a normal person.
- 75% parents thought that the personalities of their children were not changed obviously after using CI.
Before using CI, 25% of children had gone to a normal school, 64% had been trained in a deaf school or a healing organization. 2% had never accepted speech training.

After CI operation, all patients accepted speech training. 50% of them were in the healing organization, 8% were trained in family, 42% entered normal school or factories.
### Other factors that influence CI’s effect

<table>
<thead>
<tr>
<th>Grp</th>
<th>Factors</th>
<th>Example</th>
<th>Num</th>
<th>Score $\overline{x} \pm s$</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sex</td>
<td>Boy</td>
<td>49</td>
<td>$3.83 \pm 0.57$</td>
<td>$P&gt;0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Girl</td>
<td>51</td>
<td>$3.73 \pm 0.74$</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CT result</td>
<td>Ear abnormality</td>
<td>13</td>
<td>$3.85 \pm 0.80$</td>
<td>$P&gt;0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No ear abnormality</td>
<td>87</td>
<td>$3.76 \pm 0.65$</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Age at operation</td>
<td>9~10</td>
<td>26</td>
<td>$3.87 \pm 0.56$</td>
<td>$P&lt;0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>7</td>
<td>$2.29 \pm 0.95$</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Place went after operation</td>
<td>Normal school or factory</td>
<td>42</td>
<td>$4.07 \pm 0.53$</td>
<td>$P&lt;0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Still be trained</td>
<td>58</td>
<td>$3.54 \pm 0.67$</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Intervening time</td>
<td>Before 5-year-old</td>
<td>41</td>
<td>$3.94 \pm 0.73$</td>
<td>$P&lt;0.05$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After 5-year-old</td>
<td>59</td>
<td>$3.67 \pm 0.60$</td>
<td></td>
</tr>
</tbody>
</table>
Discussion and conclusion

- There are various benefits for elder age pre-lingual deaf adolescent who took a CI operation. After complete evaluation, patients can be suggested to choose CI.
- The factors which influence curative effects of CI are various. Parents should think over before deciding to choose CI for their children.
- CI database application software can bring convenience to implant center specialists.
Thank you!