COMPARISON OF COMMUNICATION AND SOCIAL SKILLS ABILITIES OF CHILDREN WITH HEARING IMPAIRMENT AFTER COCHLEAR IMPLANTATION AND PARENTAL EXPECTATIONS: A STUDY CONDUCTED IN KHUZESTAN COCHLEAR IMPLANT CENTER

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Received on 08-07-2016

Abstract

Background: Families and children should have realistic expectations about the benefits of cochlear implantation. Otherwise, they may become disappointment and even feel being betrayed. Many deaf children after cochlear implantation can achieve language skills.

Methods & Materials: This was a cross-sectional study conducted on the parents and deaf children (n=70) who underwent cochlear implantation in the Khuzestan cochlear implant center, Ahvaz, Iran.

Results: The results showed that 94.3 percent of parents were satisfied with the outcomes of cochlear implants. The average age of children was 108.29 ± 50.85 months and the average age at the time of surgery was 62.9 ± 44.16 months. A statistically significant difference was found between the onset of hearing loss and satisfaction of implantation. However, no significant relationship was observed between surgery and gender, age, age at diagnosis, and age at surgery, use of hearing aids, and family history of hearing problems. The findings showed cochlear implantation improved the ability of children to communicate according to the expectations of the parents from the implant surgery. However, no significant difference was found between the level of parental expectations and the outcomes of the implant surgery.

Conclusion: Cochlear implant surgery could satisfy the expectations of parents and even beyond their expectations in some items.

Keywords: Cochlear Implants, Parental expectations, Communication, Social
Introduction

Social competence is a broad context reflecting a child’s ability to communicate effectively with the community including peers, family members and other adults remembered as individual abilities in implementing social abilities in different ways (1, 2). These social abilities include: interactions, having norms to problem-solving, response to other individual actions and ability to show represent emotions and self-control (1, 3-6). Social competence has a deep effect on children development and facilitates relationship with family, peers and adjusting emotions and educational progress (7, 8). Otherwise, it can have predictable consequences including anxiety, antisocial behavior and can lead to mental disorders (9, 10). Since hearing-impairment in children delays speaking ability, it can increase risk of social competence loss and relevant consequences (11-15). Using dynamic systems, psychologists found that there is a close relationship between developmental backgrounds and loss in any of them will lead to increase of disorders in other fields (16-18).

Hearing impaired children which have gone through delay in development of speaking ability will have disorders in other aspects of social competence like: communication abilities, emotional connection, and individual problem-solving ability (15, 19, 20). Cognitive disorders are very probable in hearing-impaired children due to disability in having suitable relationship and feeling of inadequacy (21, 22). Hearing-impairment can reduce quality of life, social activities, and result in social withdrawal and feeling of rejection (22, 23). Different studies show that hearing-impaired children have difficulty in reading skills and gain meaningfully lower grades in schools compared to peers having natural hearing (24, 25). Hearing-impairment is a significant common problem in such a way that 1 to 3 children out of a thousand children suffer from this disorder moderate to severe due to different reasons in childhood (26).

While hearing-impairment is diagnosed late in children, it can interfere with vital development in language acquisition which plays an important role in educational success, job opportunities, and social competence. Moreover, it causes anxiousness and discomfort for families with hearing-impaired children (27, 28). Today, neonatal screening programs in most countries made diagnosis and treatment of such disorders easier than before. This has made early auditory intervention and decrease of cochlear implant age possible from moderate to severe hearing-impaired children (29).

Materials and Methods

It is a cross-sectional study based on the information collected in the Khuzestan cochlear implant center, Ahvaz, Iran in 2013. The target populations in this study are children under 20 that have gone through surgery in cochlear implant center
in Khuzestan province (Imam Khomeini hospital) and process of sampling was easily done. Measuring tools in this study were check list and questionnaire filled by parents. These tool include: information about demography, disease, patient background and questions to measure parents’ expectations from communicative abilities and social collaborative skills before cochlear implant compared to the surgery and current conditions of the children after cochlear implant surgery. To evaluate stability of the questionnaires, some of them were filled by parents gone through implant and the stability was approved. Moreover, validity of the tests has also been confirmed by experts of this center. The parents were required to sign testimonial after they were invited to cochlear implant center.

Questions related to communicative ability of the children include 12 tests including: ability to use telephone, discovering low voice, speech recognition without a need to the child’s lip reading, Child speech intelligibility for family members and strange individuals, ability to have informal speech, No need to look out for speaker’s face, no need to use sign language, ability to communicate with family members, relationship with hearing-impaired children as healthy ones, improving communicative ability of hearing-impaired children and ability to express needs and emotions by hearing-impaired child. Parents answered the questions from choices like: strongly disagree, disagree, neutral, agree and strongly agree.

Seven questions related to social and collaborative skills include: hearing-impaired children’ ability to communicate with hearing children, ability to actively involved in playing with other children, ability to accept hearing classmates, ability to accept hearing-impaired classmates, improving child’s communicative skills, starting social interactions by hearing-impaired children and ability to interact with more people and parents answered among 5 choices like questions about communicative ability. Moreover, the researcher put 2 questions at the end of the surgery with 2 opposite answers to make parents happy with the results of the surgery.

The researcher had no right to apply his views or influence parents’ opinions and the questionnaire was filled with parents or their friends. Data were gathered and analyzed with statistical package SPSS version 22.

**Results**

Seventy questionnaires were filled and delivered by those invited. There were 40 males (%70) and 30 females (%43). Average age of people studied was 108.29±50.85 months. Average age of hearing-impaired diagnosis in children was 11.04±11 months and the average age of the children in time of surgery was 62.9±44.16 months.
Among these, 17 families (24.3%) had first and second degree hearing impairments and 53 families (75.7%) had no hearing impairment history. Considering degree of hearing impairment in children, 3 individuals (4.3%) had minor impairment, 2 individuals (2.9%) were moderate, 32 individuals had severe impairment (45.7%), 29 individuals had deep impairment (41.4%) and 4 individuals (5.7%) were not aware of their children hearing impairment degree. Among these, 36 children (51.4%) had congenital hearing impairment and 13 children (18.6%) suffered from hearing loss after their birth and 21 individuals (30%) of the parents were not aware of the onset of the disorder.

Five individuals (7.1%) never used hearing aids. 6 individuals (8.6%) used aids less than 6 months, 12 individuals (17.1%) used aids for 7-11 months, 16 individuals (22.9%) used for 12-13 months and 31 individuals (44.3%) used more than 1 year.

Among 70 individuals of the parents filled and delivered the questionnaires, 66 individuals (94.3%) were satisfied with the result of the surgery done on their children.

Findings of this study showed that there was no meaningful statistical relationship between satisfaction with children sex (P= 0.181), number of family children (P= 0.513), children age (P= 0.494), age of hearing impairment diagnosis (P= 0.340), children age when the time of surgery (P= 0.260), hearing-impairment degree (P= 0.430), amount of time in using aids (P= 0.649), family history in hearing impairment (P= 0.217) (Table 1).

Table 1. Statistical evaluation between satisfaction with cochlear implant surgery and information about patients.

<table>
<thead>
<tr>
<th>Parents' satisfaction with cochlear implant surgery</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child age</td>
<td>0.494</td>
</tr>
<tr>
<td>Child sexuality</td>
<td>0.181</td>
</tr>
<tr>
<td>Onset of hearing impaired</td>
<td>0.009</td>
</tr>
<tr>
<td>Age of hearing impaired diagnosis</td>
<td>0.340</td>
</tr>
<tr>
<td>Child age in time of surgery</td>
<td>0.260</td>
</tr>
<tr>
<td>Hearing-impaired degree</td>
<td>0.430</td>
</tr>
<tr>
<td>Family history of hearing impaired</td>
<td>0.217</td>
</tr>
<tr>
<td>The time of using hearing aids</td>
<td>0.649</td>
</tr>
<tr>
<td>Number of family members</td>
<td>0.513</td>
</tr>
</tbody>
</table>
Our study shows that there is a meaningful relationship between onsets of hearing impairment and satisfaction with surgery (P= 0.009).

Parents were required to answer items like: child’s communicative ability, parents’ expectations about cochlear implant before surgery and communicative ability at the time the child received cochlear implant. Chunk by chunk study of the questionnaire parts shows that there is not a statistical meaningful relationship between parents’ expectations from surgery with child’s abilities at this time in using cell phone (P= 0.665), understanding low voice (P= 0.152), speech recognition without the need for lip reading (P= 0.593), child’s speech intelligibility for family members (P= 0.248), no need to use sign language (P= 0.088), ability to communicate with family members (P= 0.796) and ability to express needs and emotions by hearing-impaired child (P= 0.248).

However, there are statistical difference in questions about related to the child’s speech intelligibility for the strangers (P= 0.015), ability to engage in an informal conversation by the hearing-impaired child (P= 0.012), no need to look at the speaker’s face (P= 0.018), communicating with hearing-impaired child like a hearing one (P= 0.018) and significant improvement of communicative abilities of the child (P= 0.039) (Table 2).

### Table 2. Statistical evaluation of the parents’ expectations about communicative ability from cochlear implant and their evaluation after surgery.

<table>
<thead>
<tr>
<th>Parents’ expectations with cochlear implant surgery</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of cellphone by the child</td>
<td>0.655</td>
</tr>
<tr>
<td>Recognizing low voice</td>
<td>0.152</td>
</tr>
<tr>
<td>Speech intelligibility without lip reading for the child</td>
<td>0.593</td>
</tr>
<tr>
<td>Speech intelligibility of the child for family members</td>
<td>0.248</td>
</tr>
<tr>
<td>No need to use sign language</td>
<td>0.088</td>
</tr>
<tr>
<td>Ability to communicate with family members</td>
<td>0.796</td>
</tr>
<tr>
<td>Ability to express needs and emotions by hearing-impaired child</td>
<td>0.248</td>
</tr>
<tr>
<td>Speech intelligibility of the child for strangers</td>
<td>0.015</td>
</tr>
<tr>
<td>Ability to engage in an informal conversation by</td>
<td>0.012</td>
</tr>
</tbody>
</table>
Findings of collaborative social questionnaire shows that there are a meaningful difference between all items regarding parents’ expectation before surgery and the current time in which the children have gone through cochlear implant concerning chunk by chunk study of the questionnaire in such way that social collaborative abilities after surgery show more improvement than the parents’ expectations. Statistical analysis of the data show that the hearing-impaired child’s ability to communicate with the hearing one (P= 0.019), ability to actively participate in playing with other children (P= 0.012), ability to accept hearing classmates (p= 0.049), ability to communicate with hearing-impaired classmates (P= 0.032), improvement in communicative abilities of the child (P= 0.031), starting social interactions by the hearing-impaired child (P= 0.019) and ability to communicate with more people (P= 0.045) (Table 3).

**Table 3. Statistical evaluation the parents’ expectations about collaborative and social skills of cochlear implant and their evaluation after the surgery.**

<table>
<thead>
<tr>
<th>Parents' expectations with cochlear implant surgery</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicative ability of the hearing-impaired child with hearing children</td>
<td>0.019</td>
</tr>
<tr>
<td>Ability to actively participate in playing with other children</td>
<td>0.012</td>
</tr>
<tr>
<td>Ability to accept hearing classmates</td>
<td>0.049</td>
</tr>
<tr>
<td>Ability to communicate with hearing-impaired classmates</td>
<td>0.032</td>
</tr>
<tr>
<td>Improving communicative skills of the child</td>
<td>0.031</td>
</tr>
<tr>
<td>Onset of social interactions by hearing-impaired child</td>
<td>0.019</td>
</tr>
<tr>
<td>Ability to interact with more people</td>
<td>0.045</td>
</tr>
</tbody>
</table>
Discussion

Delay in diagnosis of moderate to severe hearing-impaired in children leads to loss of vital development period for language acquisition which alone limits educational success and missing social and business opportunities (30, 31). In this study, the average age of hearing disorder diagnosis was 11.4 months which corresponds with studies done by Francois et al. who reported that the diagnosis age was 12 months in France in 2011 (32). Different studies report different diagnosis age of the disorder. Jedi et al. (2012) and Jafari et al. (2007) showed the average age of diagnosis is 9.35 and 15.34 months respectively (33, 34). Moreover, Van Der Spuy and Pottas (2008) in a study reported that the average diagnosis age was 23 months (35). The reasons for this are: difference in cultural level of the family, not visiting the doctor and insufficient awareness about early intervention services and hearing rehabilitation programs. Moreover, the average age of surgery in our study was 62.9 months compared to intervention treatment which are higher than other studies like: Van Der Spuy and Pottas (35), Dalzell et al. (2000) (36), Ozcebe et al. (2005) (37) as 31, 7.5 and 33 months. Among possible reasons for delay in age in the current study compared to world values are: lack of adequate insurance coverage together with social and cultural context of the families. Moreover, Govaerts et al. (2002) have done studies to evaluate results of cochlear implant regarding age of the time of cochlear implant. After a three-year follow-up, 20 or 30 percent cochlear implant cases after 4 years, 66% cochlear implant cases between 2-4 years and 90% cochlear implant before 2 years reached to natural hearing children concerning auditory development (38).

The other variable of the study was finding at least one other hearing-impaired child in the family. According to the findings, 24.3% of the individuals declared there was another hearing loss individual. This amount was declared 21.05% in a study done by Lotfi et al., which is approximately equal to the current study (39). Liben (1978) declared that 10% of hearing-impaired children had hearing-impaired parents. We can conclude that the most important task regarding preventions of disabilities is noticing and promoting level of individual awareness about diseases and hereditary and congenital disabilities. Providing counseling services to families with one hearing-impaired child is one effective step in this direction. Among noteworthy tips in this study was high level of satisfaction with the result of the cochlear implant in the cochlear implant center in Khuzestan province located in Imam Khomeini Hospital. According to the findings, 94.3% of the families whose children have gone through cochlear implant were satisfied with the changes and results in hearing level of their children. Ghasemi et al. in a study found that there is a significant progress in auditory performance due to
cochlear implant in hearing-impaired children before language acquisition (40). Six months after cochlear implant, 91% of the children are able to respond to speech sounds. Ninety six percent of the children will be able to distinguish speech sounds one year after surgery and 80% of the children will be able to understand everyday expressions without the aid of lip reading three years after surgery. In the current study, there was not a meaningful relationship between satisfactions level with diagnosis age of hearing impairment (P= 0.340), child age at the time of surgery (P= 0.260), children sex (P= 0.307), hearing impairment level (P= 0.430), amount of time during which hearing aid was used (P= 0.649) and history of hearing loss in family (P= 0.217). This shows that families are satisfied with the results of the cochlear implant surgery on their children apart from age, sex and level of using hearing aids regarding high satisfaction from the end product (94.3%). Study done by Lotfi et al. (2009) also show that there is no relationship between employment, level of income, parents’ education and level of hearing aid application on the result of cochlear implant (39). Dilon (2001) showed that language and speech skills of the hearing-impaired children will grow and develop if the hearing aids are used full time, hearing aids are working properly and suitable speech stimulants exists (41).

In this article, Studying level of parents’ expectations from development of communicative and collaborative abilities in children with hearing impairment gone through cochlear implant surgery and its comparison with social and communicative conditions after cochlear implant, we reach to the conclusion that results of the cochlear implant concerning communicative abilities could be equal to the level of parents’ satisfaction before surgery and has no meaningful difference with that regarding items like: use of cellphone by the child (P= 0.665), recognizing low voice (P= 0.152), understanding speech without the need for lip reading (P= 0.593), speech intelligibility for family members (P= 0.248), no need for sign language (P= 0.088), ability to communicate with family members (P= 0.796) and ability to express needs and emotions by hearing-impaired child (P= 0.248). Therefore, that couldn’t reach to the level of parents’ satisfaction about cochlear implant and has meaningful difference with it regarding questions related to speech intelligibility of the child for strange individuals (P= 0.015), ability to engage in an informal conversation by the hearing-impaired child (P= 0.012), no need to look at the speaker’s face (P= 0.018), parents’ communication with hearing-impaired child just like a hearing one (P= 0.018) and significant improvement of communicative skills of the child (P= 0.039). It seems that this discontent of the parents need more time regardless of meeting other needs of the parents and this is only possible by improvement in speech rehabilitation programs in children.
Findings of our study showed that the result of cochlear implant concerning collaborative and social skills in all items asked including ability of hearing-impaired child to communicate with hearing ones, ability to actively participate in playing with other children, ability to accept hearing classmates, ability to communicate with hearing-impaired classmates, improvement of communicative skills, onset of social interactions and ability to interact with more people could satisfy parents’ expectations and even beyond this level and have statistical meaningful difference with them.

Acknowledgment

This work was part of the MD. thesis of Mohammad soleimani, approved by the Hearing & speech Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, IR Iran. We thank the research affairs of Ahvaz Jundishapur University of Medical Sciences for their financial support and Ahvaz cochlear Implant Center for cooperation with the researchers.

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