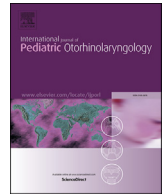




Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: <http://www.ijporlonline.com/>

Evaluation on health-related quality of life in deaf children with cochlear implant in China



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ARTICLE INFO

Article history:

Received 30 March 2016

Received in revised form

6 June 2016

Accepted 8 June 2016

Available online 28 June 2016

Keywords:

Health-related quality of life

Prelingual deaf children

Nijmegen cochlear implant questionnaire

Health utility index mark III

ABSTRACT

Objective: Previous studies have shown that deaf children benefit considerably from cochlear implants. These improvements are found in areas such as speech perception, speech production, and audiology-verbal performance. Despite the increasing prevalence of cochlear implants in China, few studies have reported on health-related quality of life in children with cochlear implants. The main objective of this study was to explore health-related quality of life on children with cochlear implants in South-west China.

Study design: A retrospective observational study of 213 CI users in Southwest China between 2010 and 2013.

Methods: Participants were 213 individuals with bilateral severe-to-profound hearing loss who wore unilateral cochlear implants. The Nijmegen Cochlear Implant Questionnaire and Health Utility Index Mark III were used pre-implantation and 1 year post-implantation. Additionally, 1-year postoperative scores for Mandarin speech perception were compared with preoperative scores.

Results: Health-related quality of life improved post-operation with scores on the Nijmegen Cochlear Implant Questionnaire improving significantly in all subdomains, and the Health Utility Index 3 showing a significant improvement in the utility score and the subdomains of “hearing,” “speech,” and “emotion”. Additionally, a significant improvement in speech recognition scores was found. No significant correlation was found between increased in quality of life and speech perception scores.

Conclusion: Health-related quality of life and speech recognition in prelingual deaf children significantly improved post-operation. The lack of correlation between quality of life and speech perception suggests that when evaluating performance post-implantation in prelingual deaf children and adolescents, measures of both speech perception and quality of life should be used.

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1. Introduction

Cochlear implants (CI) are a widely accepted treatment for severe-to-profound deaf children and adults. Over the past a few decades, CI have improved speech perception performance in quiet and noisy situations; many CI recipients have achieved open-set speech understanding without lip-reading and they can also use the telephone [1]. Aside from the improvement in speech perception, speech production, audiology-verbal performance, and quality of life (QOL) with CI have received comparatively less attention.

These are important aspects of QOL after the definition by WHO, where “physical health, psychological state, level of independence,

social relationships, and their relationships to salient features of their environment” are mentioned as important factors (WHO QOL Group, 1993). Despite the lack of uniform definition of health-related quality of life (HR-QOL) today it is usually referred to as “patient emotional, social and physical well-being, including their ability to function in the everyday life” [2]. Studies on HR-QOL have increased sharply in the developed world compared with the developing country over the last two decades and HR-QOL questionnaires have become a key instrument in population health assessment, treatment evaluation, and care management [3–7]. Moreover, using an international validated questionnaire [8–12] in this type of studies is recommended because it allows for comparing different CI populations and creating the opportunity to monitor the effect of CIS in deaf patients. Liu et al. [13–15] using the Chinese version of NCIQ investigated postlingual deaf adults and proved the validity and reliability in the population. Therefore the

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economic and education levels contribute for Chinese prelingual deaf children could receive cochlear implantation in time. To date, few studies have explored HR-QOL of the preschool deaf children. The main objectives of study investigate HR-QOL of this population.

HR-QOL is usually measured via three instruments, including generic instruments, ad hoc instruments, and parents' views and experiences with pediatric CI questionnaires [16,17], such as the Health Utilities Index Mark III (HUI3) [18], Short Form-36 (SF-36), and Nijmegen Cochlear Implant Questionnaire (NCIQ). Although all of these HR-QOL instruments are applied to adults in the same way as they are to children and adolescents, which is not suitable as, currently, there is little research on whether children and adolescents describe their HR-QOL within the same dimensions as adults.

The lives of children and adolescents contain three different components [19], with instruments that assess children and adolescents emphasizing items corresponding with experiences, activities, and the context of age and speech perception and recognition [17] [20]. Thus, in the current study, we use the HUI3 and NCIQ to evaluate the HR-QOL of prelingual deaf children.

Despite the SF-36 being freely available and easy to administer, the SF-36 has a number of major drawbacks, most significant of which is the lack of content specificity relative to hearing and communication impairment. Further, it does not have a quantifiable scale with which health utility can be measured [9].

The Nijmegen Cochlear Implant Questionnaire is a specific and quantifiable self-assessment HR-QOL questionnaire [21]. It is a valid tool that has assessed the QOL of Chinese post-lingual deaf adult speakers with unilateral CI; however, it lacks sufficient clinical trials and research using the same tool on HR-QOL of pediatric CI users to provide a utility index for prelingual deaf children and adolescents [14].

The Health Utility Index Mark III (HUI3) has received more attention recently and it measures health status in 8 attributes: vision, hearing, speech, ambulation, dexterity, emotion, cognition, and pain. Each dimension has up to 5 or 6 levels. It has demonstrated that the HUI3's health status classification system and preference-based scoring functions do not vary across studies. Meanwhile, the HUI3 has structural independence according to a poll of experienced clinicians [2,15,22–25].

While it is unclear why these differences among the instrument scores exist, it is perhaps due to the different aspects of health that are being measured. Thus, we prefer to use generic measures and disease specific instruments, such as the HUI3 and NCIQ, to ascertain the health differences of prelingual deaf children and adolescents with CI. These two measures are also advantageous because they rely on self-reporting and those receiving CI are only required to classify themselves on 8 health attributes.

Therefore, the purpose of the present prospective study was to assess the changes in the HR-QOL of children and adolescents who wore a single-side CI using the HUI3 and NCIQ.

2. Materials and methods

2.1. Participants

A series of 213 consecutive patients was followed prospectively from before until at least 12 months after their implantation date. The NCIQ and HUI3 were sent together with a letter or e-mail in which the goal of this study was outlined to 259 CI users between 2010 and 2013; 213 (118 boys, 95 girls) cochlear implant users undergoing CI operations completed both the HUI3 and NCIQ preoperatively and 1 year postoperatively. Data were also collected to include patients' demographics, and preoperative and post-operative audiometric results (Table 1). Intervention consisted of a cochlear implantation either Medel or Cochlear.

Eligible participants were children aged 48 months to 11 years without disabilities that effect recognition abilities. The inclusion criteria for the participants was as follows: (1) using oral-aural communication; (2) profound bilateral sensor neural hearing loss and severe-profound deafness resulting in unilateral CI use for more than 12 months; (3) deaf children who had been using a hearing aid since childhood to ensure that they had been exposed to auditory input in the past, and who had used CI made by Med-E1 (Innsbruck, Austria), Cochlear (Lane Cove, Australia) or Advanced Bionics Corporation (Sylmar, California); (4) those who received the first set of questionnaires pre-operation and the second set 1 year post-operation; (5) CI users who were usually using their implant every day and who were regularly consulted post-implantation; and (6) CI users who were reviewed and approved by the Institutional Review Board of the First Affiliated Hospital of Chongqing Medical University, China.

2.2. Materials: the NCIQ and HUI3

The cross-culture adaptation measures were used to translate the NCIQ into its Chinese version prior to the beginning of this study, but our study using the NCIQ designed to prelingual deaf pediatric CI users. The NCIQ is a quantifiable self-assessment HR-QOL instrument specific for CI users [2,26], which provides a measure of benefits that can be used to compare the status of the individual pre- and post-operative. The NCIQ is a 60-item disease-specific instrument that consists of 6 sub-domains, measuring basic sound perception, advanced sound perception, speech production, self-esteem, activity, and social interactions. The answers to the questionnaire are provided on a 5-point Likert scale, varying from "never" to "always", with scores ranging from 0 (very poor) to 100 (optimal). As in the original paper of Hinderink et al., the answer categories for all items were transformed: 1 = 0, 2 = 25, 3 = 50, 4 = 75, and 5 = 100. Scores for the sub-domains were computed by adding together the 10-item scores of each subdomain and dividing by the number of completed items. Using an internationally validated questionnaire in this type of study is recommended because it allows for comparisons between different CI populations and provides the opportunity to detect the effect of CIs in deaf patients. The present study aimed to demonstrate the NCIQ's ability to quantify the self-assessment of prelingual deaf pediatric CI users' HR-QOL in southwestern Chinese.

The HUI3 health questionnaire is a generic QOL instrument used to assess the HR-QOL of individuals who undergo a medical or surgical intervention. The HUI3 includes a multi-item scale that assesses 8 different health domains, including physical functioning, role limitations due to physical problem, social functioning, bodily pain, and general mental health, role limitations due to emotional problems, vitality, and general health perception. Each domain is scored on a range from 0 to an optimal score of 100. The HUI3 health questionnaire was a routine survey administered to all patients in the CI program at our institution.

2.3. Speech perception

Speech perception scores were obtained in a sound-field open-set condition using Mandarin Speech Perception test materials (MSP™). Fu et al. reported that MSP™ is an open setting of Mandarin speech perception test materials, which were verified phonetically and tonally balanced within and across test lists. The MSP™ meet four important criteria: familiarity, homogeneity, phonetic balancing, and list similarity. In addition, the MSP™ serve as standard test materials consisting of sentences as well as disyllabic and monosyllabic words [27].

All stimuli were presented at 65 dB sound pressure level in a

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