

AUDIOLOGICAL TESTING OF COCHLEAR IMPLANTED CHILDREN IN AN EARLY INTERVENTION PROGRAMME IN SOUTH AFRICA

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Summary

The aim of this study was to determine protocols and standards that are being used for cochlear implant candidacy in the South African paediatric population. Data from an early intervention programme was audited to determine what testing procedures are being employed at specific ages. Results indicated an increased use of electrophysiologic methods of audiological testing and limited use of behavioral testing methods. Development of clear criteria for implantation, together with an association to oversee and validate implantation decisions is needed. Further research on implantation and schooling options for these children is especially important in a country like South Africa where resources are limited.

Introduction

South Africa does not currently have any legislation for the early detection of paediatric hearing loss. However, small pilot screening programmes are being conducted across the private and public sectors (1, 2) creating awareness of the need for early identification of hearing loss. Despite this lack of legislation and in recognition of the need for guidelines relating to identification of and intervention for paediatric hearing loss, the Health Professions Council of South Africa has compiled a position statement which describes benchmark indicators for the EHDI pathway (Early Hearing Detection and Intervention). These indicators state that infants should be screened by the age of 4 months, amplified by 6 months and enrolled in an early intervention programme by 8 months of age (3). While this lags behind American guidelines of screening at birth, amplification by three months of age and enrolment in early intervention by 6 months (4), the development of guidelines is in itself an improvement in the South African early hearing detection and intervention arena. The Health Professionals Council Hearing Screening Position Statement (2007) also advocates the provision of family based intervention services within interdisciplinary programmes, as well as recognition of the importance of informed choice and respect for cultural beliefs and traditions of families (p 27). This is especially important in a multicultural context like South Africa as any intervention that is not culturally competent (5) could result in parents delaying their attempts to access early intervention services (6).

Screening of hearing is followed by diagnostic testing. This includes behavioural and electrophysiologic measures, depending on the age as well as motor and cognitive ability of the child. The American Speech Hearing Association (ASHA) guidelines on diagnostic testing recommend the following:

- Infants 4 months or younger – Auditory Brainstem Response (ABR) , Otoacoustic Emissions (OAE), Behavioural assessment (for corroboration of parent’s report of child’s auditory behaviour)
- 5-24 months - “Visual Reinforcement Audiometry (VRA) is the behavioural test of choice”, ABR to be conducted if behavioural testing is unreliable

- 25-60 months – Behavioural assessment (including Speech Awareness Threshold (SAT) and Speech Reception Threshold (SRT)) (7)

These guidelines are accepted as best practice for diagnostic testing of paediatric audiology clients. The use of behavioural testing after 5 months (once the child has head control), reduces the need for anaesthetic in these children as electrophysiologic measures are affected by movement artefact. However, behavioural testing requires skill in observation of responses to sound, and in older children for VRA and play audiometry, the ability to condition the child to respond to the sound.

In a multicultural country like South Africa, linguistic and cultural barriers pose a difficulty in the behavioural audiological assessment of children from different language groups. South Africa has 11 official languages, although the cultural diversity of audiologists is such that only a small percentage speak a language other than English (8). This will make conditioning for behavioural testing difficult and time consuming if there is a linguistic mismatch between the audiologist and child and could result in an increased use of electrophysiology. A study conducted on audiological testing of children in an early intervention programme in South Africa indicated increased use of electrophysiologic measures and limited use of behavioural testing (9).

Once diagnosed the audiologic profiles are studied to ascertain candidature for the different options of amplification. The primary audiologic criteria for implantation in South Africa is that the child have a severe to profound hearing loss with little or no benefit from hearing aids after a 6 month trial (10). In addition to these primary criteria written policy guidelines or a formal position statement on implantation criteria were not found in South Africa. Internationally such guidelines are more specific, for example the British policy guidelines state with much more specificity what profound hearing loss entails (profound bilateral sensorineural hearing loss is defined as “hearing thresholds greater than 90dBHL at 2 and 4kHz as assessed by an experienced specialist paediatric audiologist/clinical scientist using age appropriate measures (11). With regard to a hearing aid trial period as requirement for an implant, the criterion in the UK is “3 months use of optimised acoustic hearing aids”, fitted to an appropriate hearing aid prescription and optimised to the individual patient’s needs as required. South African guidelines do not indicate what level is considered to be “profound” or that age appropriate measures need to be used for thresholding purposes.

With the lack of clear audiologic guidelines for implantation, the audiologic profiles of implanted children were reviewed to determine if there was a consistency in audiological procedures conducted.

Material and Methods

All children enrolled with the HI HOPES early intervention programme fill in comprehensive registration forms when registering with the programme. Parents provide the interventionist with copies of all audiological information to ensure a holistic profile is developed for each child. If parents have not received a copy, permission is granted to the programme audiologist to contact the hospital or diagnostic audiologist and request a copy of the records. A retrospective review of audiology records available for the children in the programme who received cochlear implants was conducted.

Results

The audiology testing profiles of implanted HI HOPES children (as provided to parents) as well as use of hearing aids (as reported by parents) prior to implantation are provided in Table 1 and Table 2.

	Tympanogram	Ipsilateral reflexes	OAE	AC ABR	BC ABR	ASSR	AC VRA
Child 1	√		√	√			
Child 2	√	√	√	√		√	
Child 3				√			√
Child 4	√			√	√	√	
Child 5			√	√			
Child 6				√			√
Child 7				√		√	√
Child 8				√		√	
Child 9	√	√	√	√			√
Child 10				√			

Table 1

	Age of Diagnosis	HA Fitting	HA Use	Age of Implantation
Child 1	8 months	8 months	7 months	15 months
Child 2	27 months	27 months	10 months	37 months
Child 3	21 months	24 months	misplaced, moulds small, inconsistent use	33 months
Child 4	6 months	9 months	inconsistent, small moulds, infections	21 months
Child 5	14 months	14 months	6 months	20 months
Child 6	12 months	12 months	23 months	35 months
Child 7	6 months	25 months	2 weeks of full time use	26 months
Child 8	18 months	19 months	Inconsistent, distressed with aids	22 months
Child 9	9 months	10 months	Inconsistent, no benefit, broken	40 months
Child 10	25 months	26 months	6 months	42 months

Table 2

The lack of national guidelines noted above have led to vastly differing audiologic profiles of children that have met the criteria for implantation. All children had AC ABR conducted, but only one had BC ABR measures and AC VRA was used in only four children. Four children had OAE measures in addition to AC ABR and ASSR were used to estimate thresholds in four children. These results indicate increased use of electrophysiologic measures, even though the age of testing is well above the age at which electrophysiologic measures should

be used for thresholding purposes. Four children had behavioural measures (in addition to electrophysiologic testing). Delaroche and colleagues (12) are of the opinion that “measurement of thresholds over the whole hearing range can only be achieved by behavioral audiometry” (pg 1234).

Four children had tympanogram measures completed, of which only two had additional ipsilateral reflex measurements. The limited use of tympanogram measures is concerning when it is considered that in two children the ear to be implanted was changed at the time of the operation due to an active ear infection. Few children had bone conduction measures, so it is unknown how much an effect on threshold (and thus classification of severity of hearing loss) possible ear infections or an additional conductive component would have had.

Five children had consistent six months use of a hearing aid as a trial to determine candidacy for implantation. Five had inconsistent use, either due to recurrent ear infections, small moulds or aids going in for repairs. The manner in which parents are provided information on the importance of the hearing aid trial, as well as their expectations of the cochlear implant will likely affect whether they ensure the child consistently uses the hearing aid. The lack of standardised information or protocols to follow across cochlear implant programmes, makes this a subjective issue that can be influenced by the views of individual cochlear implant teams.

Conclusions

The success of cochlear implants is dependent on the selection of appropriate candidates, and implementation of appropriate rehabilitation and therapy measures to ensure optimal language development, and ultimately speech development. As an early intervention programme we believe that this typical language development is achievable as a standard across all cochlear implant programmes if the following is adhered to, as is the case in other countries implementing national EHDI programmes:

- Development of clear guidelines for implant candidacy with variables such as level of hearing loss clearly defined. Since South Africa does not have specifically trained paediatric audiologists, there should be a clear delineation of tests to be conducted as part of the paediatric audiologic test battery.
- Clear criteria for hearing aid use and how benefit will be measured including all tests that need to be conducted in this regard.
- The development of screening programmes for earlier identification and intervention for children with hearing loss, in order to allow for maximum language development. Once implanted, this language development can be used as a base on which to develop spoken language.
- The development of a database that allows access to and sharing of information across different practices. This will prevent parents trying to meet different candidacy criteria at many different centres. Sharing of audiological information will also make the repeat of tests unnecessary (saving both time and money) and allow for a focus on getting a range of tests done, allowing for cross-check across the paediatric test battery.

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