

UNIVERSAL NEONATAL SCREENING (UNHS) IN POZNAŃ

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Introduction

Late diagnosis of hypoacusis is the main cause of speech disorders, retardation or even complete lack of speech development. Introduction of the program of obligatory auditory screenings in neonates in Poland fulfilled the postulate of the 1998 European Consensus (Milan) concerning early diagnosis of hearing impairment.

The founder and initiator of auditory screening in Poland: the Great Orchestra of Christmas Charity invited experts in neonatology, laryngology, audiology, phoniatrics, engineering, and other specialists were invited to support the project. The "UNHS" program run into beginning in autumn of 2002 [1, 7, 9, 18].

The aim of the UNHS program is examining the condition of the organ of hearing in all neonates in Poland and the earliest possible hypoacusis detection, but also applying proper rehabilitation procedures to the age of 6 months. The program consists of three diagnostic levels. The first level is carried out in all obstetric and neonatal wards in Poland (ca 330 institutions). During stay on the neonatal ward every child whose mother granted permission is given a questionnaire of hearing impairment risk factors [1, 13, 16, 17]

Children undergo the first test in their second or third day of life. The UNHS Program Board has chosen acoustic otoemission (TEOAE) as the testing method. It is a non-invasive method, with high level of specificity and sensitivity in hearing screening, short and easy to use by the nurse or midwife and automatically recorded. Normal OAE results and negative interview concerning risk factors finish the test. Newborns are given a certificate confirming they have undergone the screening with normal hearing results. [6, 12, 14].

If the incorrect result is confirmed the newborn is referred to an institution of second level of reference.

The second levels of reference are institutions of audiological and laryngological diagnostics. At least one such centre was created in every province (more than 50 of them operating by now). The tasks of these institutions are rescreening and, in case of confirmed hypoacusis, full audiological testing.

The methodology includes:

verification of risk factors of hearing impairments and observations of child's hearing behaviours,

laryngological examination with external auditory meatus evaluation

DPOAE measurement.

Positive result of the hearing testing (*pass*) finishes the auditory screening. Negative result – no otoemission (*refer*) is an indication for further audiological diagnostics, determining the type and degree of hearing defect (impedance audiometry, ABR). [10, 11, 15]

Children below six months of age are referred to the third level of reference centres, which perform the ABR audiological test with hearing threshold reconstruction (13 centres in Poland). Infants diagnosed with hypoacusis deeper than 40 dB are fitted hearing aids and begin rehabilitation and specialist auditory and surdologopedic trainings. After 3-6 months of training the pre-audiological assessment is repeated. If the cochlear implant is required children have to undergo CI qualification procedure in the first year of age. According to the principles of the UNHS program infants with hypoacusis, who are treated and rehabilitated, should consult the audiological centres at least every six months till 3 years of age for hearing control.

Material and methodology

The Phoniatrics and Audiology Department of the Medical University in Poznań carries out the second and third level of the UNHS Program. 2100 infants were referred from the neonatal wards to undergo the tests if:

their first stage auditory screening resulted in REFER, i.e. if no otoacoustic emission at least in one ear was diagnosed,

their history indicates risk factors of hearing loss, (although their first level of reference screening resulted in PASS),

infants from other second level of reference centres with preliminary suspicion of hypoacusis.

The methods of the audiological screening enclosed DPOAE measurement, impedance audiometry and ABR. Tests were carried out in a soundproof room while neonates were awake or in a natural sleep.

Results

Between October 2002 and 2006 2100 infants, including 989 girls and 1111 boys of the average age of 20 months have undergone the auditory screenings in the Phoniatrics and Audiology Department 2766 DPOAE, 1536 ABR and 960 impedance audiometry tests were carried out.

According to the principle of cross-check test children from the *refer* group have undergone the impedance audiometry and ABR test determining the hearing threshold, what lead to diagnosis: (norm of hearing, conductive, mixed or sensory neural hypoacusis). 8, 7% of children who have undergone the screening were diagnosed with hearing loss deeper than 40dB were fitted hearing aids and started auditory training combined with surdologopedic rehabilitation. 2.6 % of children have been qualified to undergo the cochlear implant. 1.1% of children were implanted with CI before 2 years of age.

A detailed analysis of screening was carried out in one year 2006 on the group of 410 children, with the following results:

hypoacusis was not confirmed in 87.6 % children.

sensoneural hypoacusis in both ears in 6 % children,

sensoneural hypoacusis in one ear in 2.8 % children,

conductive hypoacusis in 3.6 % children,

In 2006 there were 28 cochlear implantation performed in children in pre-school age (below the age of 7). The average age of operated child was 38 months.

Efficient implementation of universal auditory screenings is possible only when 95% of the entire population of neonates is included. According to UNHS Program Board data 98.14 % of all newborns have been examined in Poland. Application of the UNHS program in Poland has two main goals: 1. testing the hearing in the whole population of neonates in the first days of their life, early detection of congenital hypoacusis. These goals were achieved. The screenings allowed for early use of hearing aid and rehabilitation of children with hypoacusis, what lead to lowering the average age of children qualified for deafness surgery treatment. It was necessary to apply a fast and simple diagnostics method to achieve these goals, maintaining proper rules of sensitivity and statistic specificity. Acoustic otoemission measurement was the best common method of auditory testing on neonatal wards. It was possible to obtain a result confirming good hearing in over 95 per cent of examined population.

Conclusions

The applied model of auditory screenings (I level-OAE, II level-OAE, IA, ABR. III level-hearing aid and rehabilitation) allowed for early diagnostics in sensory neural hypoacusis (>40dB).

Hearing aids, auditory training and rehabilitation of the communicative process beginning at the age of 6 months make the development of a child suffering from congenital hearing loss similar to other children of its age with normal hearing. Children with profound sensory neural hypoacusis in both ears diagnosed in the UNHS program, without sufficient profit from hearing aid, may be qualified to the cochlear implants program after only 6 months of rehabilitation, at the age of approximately 12 months. [3, 4, 5, 15]

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