

UNHS program – preliminary results in Romania

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This paper presents preliminary outcomes of an ongoing universal newborn hearing screening in Romania. The main objective of this program was to evaluate the feasibility of the designed protocol, in order to extend this national pilot program to more maternities around Bucharest, our capital and in the country. Eight thousand eight hundred one (8801) babies from both well-baby and NICU wards were screened either just by automatic TEOAE either by both ATEOAE and automatic ABR. From 10.110 alive newborns in 3 maternities (2 in Bucharest and 1 in Timisoara) in a time-window of 10 months, 87.05% were screened and they received appropriate further recommendations. We consider that chosen protocol has the capacity to reliably identify infants with congenital unilateral or bilateral hearing loss. This gives us the opportunity to start early intervention for each hearing impaired infant.

Key words

Universal newborn hearing screening

Permanent hearing loss

Mute and deaf

Automatic otoacoustic emissions

Automatic auditory evoked brainstem responses

Abbreviations

ATEOEA – automatic transitory otoacoustic emissions

AABR – automatic auditory evoked brainstem responses

ASSR – auditory steady-state responses

NICU – neonatal intensive care unit

Permanent bilateral hearing sensorineural loss is an important disease, with a high incidence in alive healthy newborns (1-3%)^{1,2}. Its incidence is 10 times higher in newborns at risk for hearing loss (1-2%).

This handicap is an invisible one and can be easily missed by parents until 2-3 years old.

Without early intervention, input is missing in the auditory pathways. This leads to less myelinisation at this level. Structural abnormalities occur, consisting of less development of white matter in auditory cortex.

This ongoing process of auditory deprivation has multiple consequences:

delay or impaired language acquisition³; research in this field showed that language development is significantly better in children with hearing loss diagnosed before 6 months old, followed by appropriate intervention, compared with infants who are diagnosed after age of 6 months. It is considered that 90% of 5 years old hearing impaired children have permanent hearing loss since

neonatal period⁶. Normal hearing is a prerequisite for normal language development. Language perception and production are impaired by lack of normal auditory feedback loop.

limited access in academic process

less financial outcome from job

For all these reasons active finding of hearing loss is mandatory. This can only be achieved by universal newborn hearing screening, followed by audiologic diagnostic for referred infants. Once hearing loss is detected, complete medical and genetic, if possible, evaluation is carried on in order to have complex information about hearing loss syndrome.

Detection and quantification of hearing loss must be followed by early appropriate intervention – conventional hearing aids or cochlear implant for children without benefit from hearing aids.

In Romania exist national screening programs for some diseases, even less frequently (ex. Phenylketonuria is 60 times more rare than hearing loss), but not for hearing loss until recently.

Mean age of presentation in ENT departments of hearing impaired children is around 3-4 years old, when parents become suspicious regarding absence of language. Of course, this is already late for normal speech development.

After several years we finally managed to have a pilot screening program for hearing in newborns. Money from Ministry of Health was obtained in 2005 for 3 maternities (2 in Bucharest and 1 in Timisoara) and 1 diagnostic centre (Institute of Phono-Audiology and E.N.T. Functional Surgery, Bucharest).

After equipment acquisition and instructional courses we really started in February 2006.

Material and methods:

Tested subjects

All alive newborns from 3 maternities were screened before discharge. Well-babies usually leave maternities after 2-3 days and they were screened just before that. We missed some babies (12.87%) due to more rapidly discharge or temporary lack of testing conditions.

Methodology for hearing screening follows listed protocol

In day 2-3 of life for healthy newborns or 1 day before leaving maternity for newborns who needed NICU or longer periods in the maternity, first step of screening is performed with automatic OEA (portable equipment Echo-Screen); if the result is PASS (fig.

1), the child will be periodically evaluated (kinder garden, school, high school / not always with very specific methods, unfortunately). For babies from NICU wards

automatic ABR is also performed, since auditory dys-synchrony has a higher incidence in this particular group of babies.

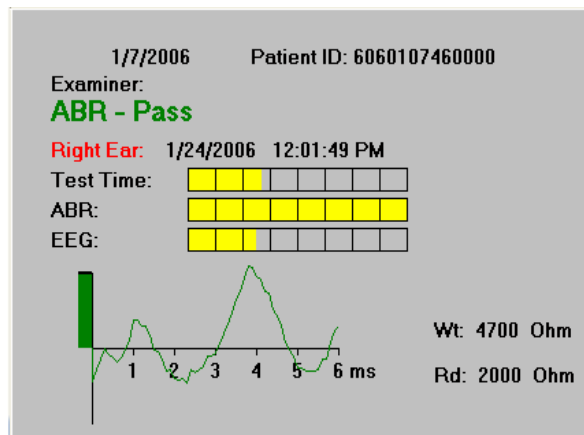
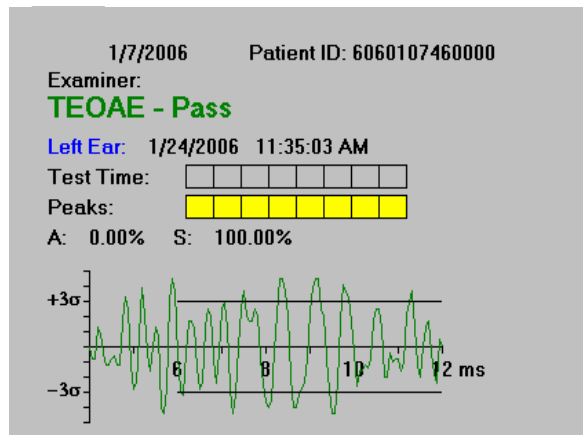


Fig. 1 PASS results in automatic TEOEA and ABR

if the result is REFER (fig. 2), the baby will be re-screened in the same maternity, one month later, also with automatic OEA. If result is still negative, automatic

BERA is performed in the same session; if the baby still REFER the tests either in one or both ears, further investigations are recommended.

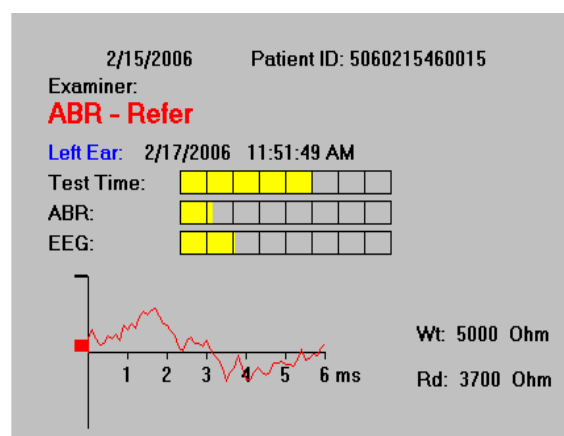
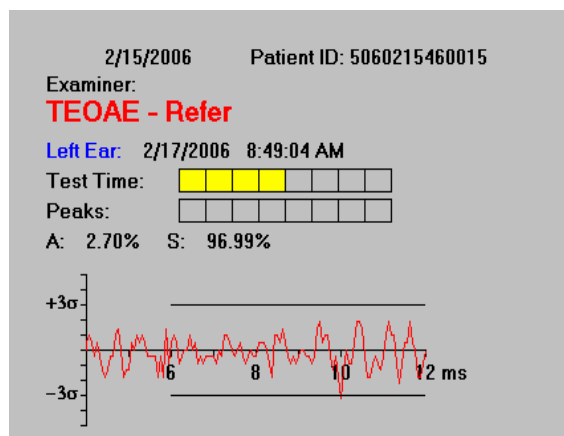


Fig. 2 REFER results in automatic TEOEA and ABR

infants are scheduled for audiologic diagnostic in the Audiological centre until 3 month corrected age. During natural sleep, even in multiple sessions, hearing is inves-

tigated by OAE (ILO 292 USB II) (fig. 3). If they PASS the test, hearing is considered normal

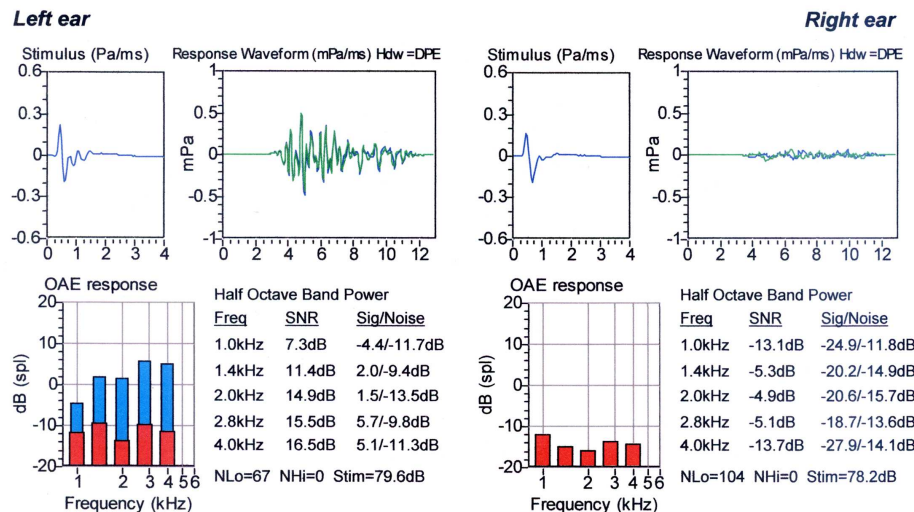


Fig. 3 Audiologic diagnostic – TEOEA, PASS and REFER respectively

if result is REFER, click- and tone burst-ABR and ASSR (Bio-logic) are performed (fig. 4). Impedancemetry with high frequency probe tone (1kHz – OTOFLEX)

is also performed. Considering this latter investigation, in some babies we also performed bone conduction ASSR

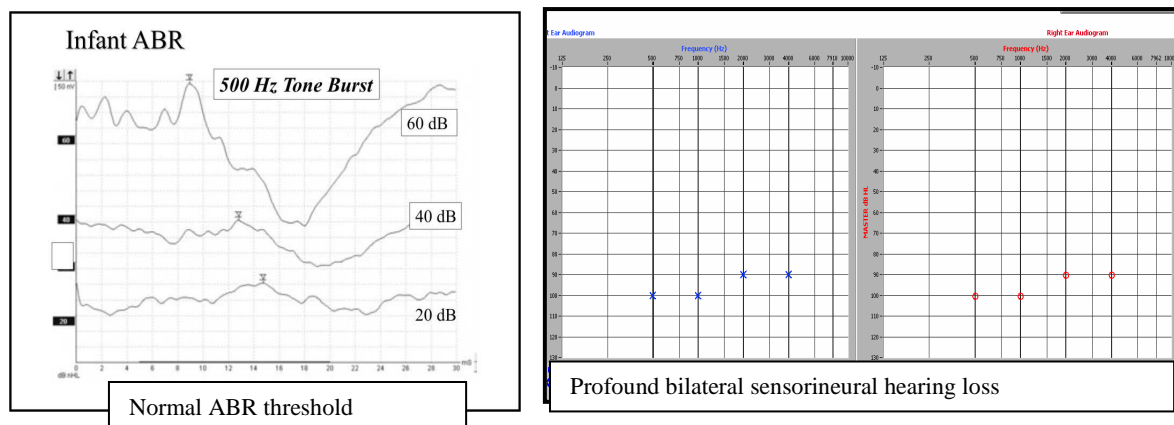


Fig. 4 Audiologic diagnostic – tone-burst ABR (normal hearing) and ASSR (profound bilateral hearing loss), respectively

from this moment, children with hearing loss will have bilateral hearing aids, for at least 6 month; if the child will have no benefit, further investigations will be carried on for cochlear implantation.

Results

Both screening methods (ATEOAE and AABR) use statistical binomial algorithms for evaluating OHC and, respectively, auditory pathways function. By this statistical method, responses are more robust in noisy environment and have a higher confidence rate (99.9% for ATEOAE and 95% for AABR). Stimulus intensity is 35dBnHL for TEOAE (sufficient for normal OHC to provoke response) and 35, 45 or 55dBnHL for ABR test.

In a period of 10 month (February-December 2006), from 10.110 alive newborns in above mentioned 3 maternities, 8.801 (87.05%) were screened. Among them, 36 (4.1‰) refer screening stage and came for audiologic

complete investigation. In 12 of them were (1.36‰) sensorineural hearing loss was confirmed, 7 in Bucharest and 5 in Timisoara. From those investigated in Bucharest 6 infants received appropriate amplification (based on ASSR thresholds) and 1 became candidate for cochlear implantation since he has auditory dys-synchrony. 4 children with hearing loss skip follow-up in Timisoara and 1 received amplification.

Conclusions

Preliminary results showed us that designed protocol is suitable and we consider it is appropriate since it combines advantages of two different methods – AOE and AABR. These two tests investigate different anatomical structures and have good sensitivity in hearing threshold detection. Also, disposables are not very expensive and overall costs of the program are not very high. Using both tests we in-

crease number of children with hearing loss detected by screening (90% sensitivity) and we decrease false positive rate (2%).

In conclusion, we consider preliminary results encouraging and we try to extend this program in more maternities.

It is our duty as a society to take hearing loss into account since its frequency it is important and its consequences if untreated could be very severe – deaf children become mute as well.

Human beings live in society and are characterized by oral communication and we have to do our best to keep this, because, as Helen Keller said: “Blindness separate people from things, while deafness separates people from people.”

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