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NEONATAL HEARING SCREENING : EFFICACY OF THE OAES VERSUS AUTOMATED ABR

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ABSTRACT Hearing loss is one of the commonest detectable congenital disorders. ***Aims and objectives:*** Screening of all the neonates born for congenital hearing loss and compare efficacy of otoacoustic emissions (OAEs) and automated Auditory Brainstem Response (aABR) for hearing screening. ***Material &Methods:*** 429 babies were studied out of which 2 babies did not pass the screening tests and hearing loss was confirmed on diagnostic Brainstem Evoked Response Audiometry (BERA). ***Conclusions:*** It was concluded that 4 per thousand babies had congenital hearing loss out of which only 50% were high risk babies, which adequately emphasizes the requirement for universal neonatal screening as compared to screening only high risk babies. Another inference gathered was that automated ABR was a better modality as compared to screening OAE because one baby who passed the screening OAE did not pass aABR, hence it was infered that if either of the two modalities were to used for screening then aABR should be preferably used.

KEYWORDS : Neonatal hearing screening, otoacoustic emissions (OAEs), automated Auditory Brainstem Response (aABR)

Introduction

Hearing loss and hearing loss are global issues that affect at least 280 million people worldwide. Two-thirds of these people live in developing countries [1]. Hearing losses may lead to poor language and speech development and thereby affects the comprehensive development of the individual and his productivity. For the same, it is essential to screen all newborns to detect hearing loss irrespective of predisposition to risk factors. Otoacoustic emissions (OAE) and brainstem evoked response audiometry (BERA/ABR) are tests that effectively assess the type and degree of hearing loss. It is essential to devise protocols that will not only effectively screen all neonates but also reduce false positive results thereby reducing the time and money invested on test like ABR by the patients.

A study done on universal newborn hearing screening at Bulgaria advocates that intervention should begin ideally by the age of 6 months [2]. The same study states that early intervention has significantly higher levels of receptive and expressive language, personal-social development, vocabulary etc. P. Nagapoornima et al. reports that though incidence per 1,000 is higher among high risk infants, focusing only at high risk may miss 50 % of newborns with hearing impairment [3]. American Academy of Pediatrics (AAP) in 1999 advocated universal newborn hearing screening and remedial intervention which is now being practiced in most of the developed countries [4, 5]. In India, most of the work done in this direction is at treatment level. Even the Indian National Programme for Prevention and Control of Deafness (NPPCD) does not address the issue at neonatal and infant level. A study at Kochi, adopted a two stage OAE/ABR protocol but also suggests that this may not be very practical in our set up where cost effectiveness is a major issue [6]. The goal of any neonatal hearing screening programme (NHSP) is to perform hearing screening in all newborns prior to hospital discharge. Based on available screening tools, and maternity length of stay, hospitals are performing hearing screening of all new-born babies, the same is being done by Paediatric departments where ENT centres do not exist or by the obstetricians where both ENT spl or paediatrician are not available.

Aim: This study aims at screening all newborns to evaluate the burden of hearing loss in and to assess the efficacy of screening OAE–aABR tests protocol as screening tool of this life modulating impairment.

Objective: Compare efficacy of otoacoustic emissions (OAEs) and automated Auditory Brainstem Response (aABR) for hearing screening.

Material&Methods

The study was conducted in two hospitals of western India. It was a prospective study conducted from Jun 2015 to May 2016. A total of 429 babies born in the hospital during the study period were screened for hearing status. All babies were screened with Distortion Product Otoacoustic Emission (DPOAE) testing, further the babies were subjected to automated Auditory evoked Brainstem Response audiometry (aABR) and those who failed to pass aABR were then confirmed with Auditory Brainstem evoked Response Audiometry (ABR).

Inclusion Criteria

All newborns delivered in the study period.

Exclusion Criteria

Meatal atresia, anomalies of external ear where probe insertion was not possible. Babies with wax in external auditory canal were included in the study only after cleaning the external auditory canal.

Observations

Total 429 babies were tested between Jun 2015 and May 2016 on four stage protocol basis as described above. Out of 429 babies, 425 passed the DPOAE test while 4 children did not pass. All the babies (429 babies) were then subjected to screening ABR (aABR) and out of the 4 babies who did not pass screening DPOAE, 3 babies passed aABR. However out of the 425 babies who passed DPOAE, one baby did not pass aABR. These two babies who did not clear the screening test(s) were rescreened after 6 weeks and failed to clear the screening tests again. These babies were then subjected to diagnostic Brainstem Evoked Response Audiometry (BERA) and sensorineural hearing loss was confirmed. This account for 0.4 % refer rate. 219 babies tested were females while 210 were males. Out of 429 babies, 44 had positive history predisposing them to be at high risk for deafness. 2.3 % of these were diagnosed to have impaired hearing after complete test series which is six times higher than the babies screened who had no predisposing risk factors.

Table-1

No of babies screened	OAEs pass	OAEs refer	aABR pass	aABR refer	Diagnostic BERA
429`	425	4	427	02	02

Discussion

Hearing assessment in children is one of the dark areas in spite of the fact that two out of every 1,000 children have permanent bilateral hearing loss above 60 dB [7]. According to a recent survey data

reported by the World Health Organization (WHO), 280 million people worldwide have moderate to profound hearing loss (HL) in both ears. Most of the people who have hearing disabilities live in developing countries [1]. Four to six out of every 1,000 children born in India are found to have severe to profound hearing loss [8].

If the hearing deprivation goes on for a long time, the child may never make up for the lost learning, even after extensive rehabilitation [10]. Thus, severe to profound hearing loss has the potential to adversely affect crucial aspects of development, including social, cognitive, and academic abilities, mostly because of a delay in oral language.

Nearly 1 % of the total children screened were at high risk of developing hearing loss. In a study by Albert I. Mehl At et al., out of 126 hearing impaired babies, 63 (50 %) were high risk babies [15]. In present study out of 02 hearing impaired babies from 429 babies screened, 01 (50 %) baby was high risk baby. These results showing proportion of high risk in hearing loss is comparable.

According to John et al., 2009, low birth weight was the most common risk factor in high risk babies, which accounts for 26 (56.52 %) out of 46 high risk babies [16]. In present study, low birth weight babies/preterm babies account for 54 %. Proportion of very low birth weight babies is increased in recent times because of better and advanced neonatal intensive care units (NICU) provided to preterm and low birth weight babies now a days, which has improved the survival rate in them. The risk factors for hearing loss are well established now. The US Joint Committee on Infant Hearing position statement in 2000 [13] enumerates three major risk factors:

(a) History of treatment in NICU for > 48 h
(b) Family history of early childhood hearing loss
(c) Cranio-facial anomalies associated with hearing

Babies admitted to a neonatal intensive care unit for more than 48 h are 10.2 times more likely to have a permanent hearing loss than those who did not undergo Meningitis—most common cause of acquired hearing loss is childhood meningitis. Chan had shown proportion of high risk babies was 309 (5.04 %) out of 6,127 babies screened [14]. In present series proportion of high risk babies was 44 out of 429 babies screened. So according to this data in high risk babies screening programme, we need to screen only 10-12 % of total babies, but with it we definitely miss nearly 50 % hearing impaired babies from not at high risk groups. Chan had also shown 20 (6.47 %) hearing impaired babies were identified out of 309 high risk babies screened [14]. In present study 01 (2.3%) hearing impaired babies were identified out of 44 high risk babies screened. Data of this table suggest that the high risk babies have much higher rate of hearing impairment then normal babies. Only 0.5 % (five out of 975) of children without any high risk had confirmed hearing impairment. Therefore, meticulous screening as well as ensured follow up is a must for children at high risk for developing hearing loss.

Conclusion

Hearing loss is commonest childhood handicap that is curable and with a large quantum of its burden in developing countries like India, there is need to address this issue at national forum. Universal neonatal hearing screening is indispensable in picking up early hearing loss in order to intervene timely. Targeted screening i.e., of high risk babies only will miss out nearly 50 % of deaf children who do not present with any known high risk. Another inference gathered was that automated ABR was a better modality as compared to screening OAE because one baby who passed the screening OAE did not pass aABR, thus it was concluded that if either of the two modalities were to used for screening then aABR should be preferably used.

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