Universal Neonatal Hearing Screening

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112 children per 100,000 have congenital permanent hearing loss, 90% of whom have sensorineural hearing loss. 21 children per 100,000 will acquire hearing loss. Approximately 50% of children with moderate (30 - 50 dB) and 25% severe (50 - 75 dB) and 25% profound (more than 70 dB) hearing loss are congenital. These levels correspond to inability to hear a whisper, common conversation or a shout respectively.

Audiological status alone is a poor indicator of later academic achievements of the child with hearing impairment. Children with hearing loss at birth having a hearing aid fitted before 6 months of age, achieve language and social development levels within the normal range. Thus, a normal outcome is more likely following an early diagnosis.

In 1997, the median age at diagnosis of all hearing impairment in the United Kingdom was 20 months. With more severe hearing loss being diagnosed earlier; severe hearing loss at median 11 months and profound hearing loss at median 9 months. This delay in diagnosis of early hearing loss is due to the relative lack of availability of screening programmes. Controlled clinical trials have shown the effectiveness, efficiency and reliability of universal neonatal hearing screening including Otoacoustic Emission Tests, Auditory Brain Stem Response Testing and Portable Auditory Response Cradles.

Table 1 Indicators Associated With Sensorineural and/or Conductive Hearing Loss

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Reference</th>
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<tr>
<td>Family history of hereditary childhood sensorineural hearing loss</td>
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<td>In utero infection, such as cytomegalovirus, rubella, syphilis, herpes simplex, or toxoplasmosis</td>
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<td>Congenital malformations and/or congenital anomalies of the cochlea</td>
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<td>Birth weight less than 1500 g (3.3 lb)</td>
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<td>Fever, jaundice, requiring exchange transfusion</td>
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<td>Toxicoxic illnesses, including but not limited to the antiligomycoses, used in multiple courses or in combination with loop diuretics</td>
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<td>Bacterial meningitis</td>
<td>6</td>
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<td>Apgar score of 0 at 1 min or 0 at 6 at 5 min</td>
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<td>Mechanical ventilation lasting 5 days or longer</td>
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<td>Stigmata or other findings associated with a syndrome known to include a sensorineural and/or conductive hearing loss</td>
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Otoacoustic Emission Tests (OAEs)

Otoacoustic emissions, first described in 1978 by Kemp, are thought to originate from the active biomechanics or cochlear hairs. The child's ear canal is occluded with a probe tip (which can be ascertained. This test performs favourably when appropriate training and support is given to testers. In 1992, the distraction test reported 96% coverage and 88% sensitivity for hearing losses over 50 dB over a 4 year period. However, this test is operator dependent and, in 1997, a substantial decline in its success rate was reported following a management reorganisation. Following identification and rectification of this problem, improvement in performance to previous levels was reported.

At present, there is no mandated screening programme for hearing impairment in this country. Many paediatric units have their own criteria for screening selected patients. Some base their indicators of high risk of sensorineural and/or conductive hearing loss in neonates, as published by the American Academy of Paediatrics in 1994 - See Table 1. The American Academy of Paediatrics also recommends that screening be instituted before 6 months of age. Unfortunately, targeted neonatal hearing screening misses an estimated 50% of patients with congenital or early acquired neonatal hearing loss.

Current trends both in the United Kingdom and in the United States of America are to implement universal neonatal hearing screening programmes. New methods developed for neonatal hearing screening include Otoacoustic Emission Tests, Auditory Brain Stem Response Testing and Portable Auditory Response Cradles.

Auditory Brain Stem Response Testing

This is an auditory evoked electrophysiologic response that correlates well with hearing. Electrical activity in the brain is measured by scalp electrodes. Hearing can be screened at any level. Retrocochlear function is tested. The test takes approximately 25 to 30 minutes.

Portable Auditory Response Cradles

Transducers are positioned around the infant to detect behavioural reaction to sounds. All decibels of sound can be ascertained. Reports conflict on the efficacy and reliability of this screening method. This may be due to inadequate refinement of the equipment.

One of the main advantages of the OAE method is that it is comparatively inexpensive. In 2001, VoL compared the OAE and ABR methods and concluded that otoacoustic emission testing is more cost-effective per patient tested and is quicker to perform, thus decreasing the time spent by the audiologist per patient. But OAEs are more likely to result in false negative results and ABR methods and concluded that OAE testing is more cost-effective per patient tested and is quicker to perform.

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References