

Figure 4: A. Pure tone audiometry with headphones.
B. Pure tone testing using play audiometry.



Figure 5: A tympanometer.



ing and comprehending the different speech stimuli.

The testing is invaluable in determining how a child hears speech and, in the child with identified hearing loss, can aid in planning an auditory training program.

Central auditory processing testing, an involved set of speech testing in noise and complex listening situations, takes about 90 minutes to complete, including initial counselling, and is able to be performed in children five years and older.

Diagnostic auditory brainstem response

Auditory brainstem response testing is an objective test to quantify hearing loss. The test is used to differentiate conductive from sensorineural hearing loss and identify unilateral hearing losses, which can be difficult to detect in babies and young children using conventional testing.

Testing is labour intensive, requires specialised technicians under audiological supervision and the child needs to be resting, sedated or, on occasion, under general anaesthesia. As with the automated version, the test uses modified EEG technology to detect the child's brain activity in response to auditory stimuli.

Steady-state evoked potential

Steady-state evoked poten-

tial is an Australian-designed technique that allows fairly accurate frequency-specific plotting of the child's hearing levels, particularly in those with severe sensorineural hearing loss.

Electrocochleography

Another auditory test, usually performed in children being assessed for cochlear implantation, is electrocochleography. Under anaesthesia an electrode is placed directly on the promontory or the round window in the middle ear and the cochlear function assessed.

Tympanometry

Tympanometry is not a test of hearing. It is the measurement of the tympanic membrane's response to air pressure in the ear canal at various levels and is invaluable in assessing middle-ear function (figure 5).

The pattern of the tympanometric curve allows determination of the presence of middle-ear fluid, Eustachian dysfunction, the presence or absence of ossicular fixation or discontinuity, and whether a small occult perforation exists in children with wax debris obscuring the view of the tympanic membrane. It is also a useful middle-ear screening tool for school-aged children.

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How the GP can help detect hearing loss

WHEN taking a history, a parent's concern is a major reason to investigate a child's hearing. Table 5 lists questions that the GP should then ask the parents. These questions are only indicative of an average child and there is a wide range of variation.

For example, speech delay in a two-year-old may be a normal variation, or may be due to hearing loss, global developmental delay, neurological disorders, environmental deprivation or autism. In addition, speech delay may also present in premature babies, twins or children from a bilingual household. Other features to look for in the history are risk factors for hearing loss, as noted in table 4, and the features of congenital hearing loss mentioned earlier.

Investigation usually involves referring the child to an institution where hearing-testing facilities, including objective testing, are available. In most cases, this will involve testing by paediatric-trained audiologists in local community facilities, hospitals with paediatric facilities, or agencies such as Australian Hearing.

Conductive hearing loss

Conductive hearing losses secondary to recurrent AOM, OME or CSOM are by far the most common causes of hearing loss in childhood. The symptoms and signs (table 6) may be subtle or overt and may vary with the child's age.

Clinical diagnosis of OME remains one of the more difficult tasks, especially with a febrile or screaming child, when the red ear may mimic AOM. There are many different otoscopic appearances of the tympanic membrane, both in colour and degree of thickening and retraction. Retraction and immobility on pneumatic otoscopy remain the best markers for diagnosing OME. Various otoscopic appearances of OME are shown in figure 6.

CSOM is easier to detect with either a dry perforation or otorrhoea noted, and perforations ranging in size from pinhole to subtotal. The perforation may be central or marginal and the clinician should be aware of the possibility of cholesteatoma complicating the latter, especially in the child with otorrhoea recalcitrant to consistent treatment with Betadine ear toilets and topical drops.

Cholesteatoma with invasion of skin into the middle ear structures may also be seen, with deep retraction pockets, particularly in the

Figure 6: Differing otoscopic appearances of OME.

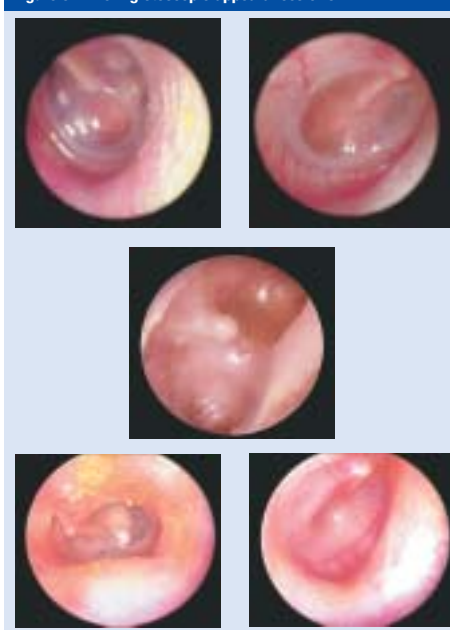


Table 5: Questions to ask parents about their child's hearing

Age	Questions
3-12 weeks	Does your baby startle or open their eyes when they hear a noise?
Six months	Does your baby try to turn their head towards sound?
Nine months	Does your child enjoy babbling, and respond to soft sounds?
One year	Does your child say a few baby words, and respond to their name?
18 months	Does your child have 10-20 words and short phrases?
Two years	Does your child have 50 words and 3-4 word sentences?

Table 6: Signs and symptoms of hearing loss in childhood

Age	Signs and symptoms
Infant	<ul style="list-style-type: none"> Irritability Nocturnal waking Scratches secondary to pulling at the ears
Toddler	<ul style="list-style-type: none"> Delay in speech and language acquisition Balance problems (OME is the most common cause of balance disorder in childhood) Frequent falls Prolonged walking around furniture until age 18 months or later
Preschool	<ul style="list-style-type: none"> Sits close to the television Misses soft syllables at the beginning of words Mis-hears questions, eg, "How are you?" may be responded to with "four" (ie, the child hears "How old are you?")
School aged	<ul style="list-style-type: none"> May not perform to expectations In another world Socially isolated Frustration leading to disruptive behaviour, truancy, early clashes with the judicial system

attic. Prompt referral of these patients to an otolaryngologist may help early removal of the disease and restoration of hearing.

The Aboriginal or Torres Strait Islander child may present differently, with early invasion of the nasopharynx by pneumococcal bacteria, leading to OME in up to 90% of the infants by 12 weeks of age. The average indigenous child will have one of the forms of otitis media for 32

months during childhood, as opposed to three months in the non-Aboriginal child.

The symptoms of otitis media may be confined to malaise, anorexia and diarrhoea, followed by "silent" otorrhoea. The burden of this disease to the child, when English may not be the primary household language, is enormous and may affect speech, language and educational and vocational outcomes.