Otitis media: a common childhood illness

What is otitis media?

Otitis media is inflammation of the middle ear and the tympanic membrane, which often occurs as a result of an acute upper respiratory tract infection. Generally, it is caused by a viral infection that is then complicated by a secondary bacterial infection.[1] However, the initial infection may also be bacterial.[1]

Otitis media is very common in children and there is a high rate of spontaneous recovery. It has been suggested that it is an unavoidable illness of childhood and part of the natural maturation of a child's immune system.[2] Despite this, suppurative complications can occur, such as perforation of the tympanic membrane, otitis externa and mastoiditis, as well as other sequelae affecting balance, motor control and hearing.[2]

Otitis media covers a spectrum of conditions, of which the most common are acute otitis media and otitis media with effusion (OME). Pneumatic otoscopy or tympanometry if available, are used to aid diagnosis.

What are the risk factors for otitis media?

The main factors influencing the risk of a child developing otitis media are host-related or environmental (Table 1, over page). Children living in communities where overcrowding is common are at increased risk of developing otitis media.[3] Māori and Pacific children are more likely to be affected by otitis media than European children in New Zealand, however, reliable estimates of prevalence by ethnicity are not available.

Acute otitis media

By age three years, 50 – 85% of children will have had acute otitis media.[2] The incidence peaks between age 6 – 12 months, and recurrent acute otitis media is common, affecting 10 – 20% of children by age one year.[2]

Diagnosis of acute otitis media

Children with acute otitis media have rapid onset of pain and/or fever. The most useful symptom for diagnosis is otalgia (ear pain). Children may also display symptoms of an upper respiratory tract infection, abnormal ear tugging, otorrhoea (discharge from the ear), hearing loss, irritability and not settling at night (pain increases when supine).[5]

On otoscopic examination, the tympanic membrane will:

- Bulge due to effusion with a loss of normal landmarks
- Show areas of intense erythema and/or a yellow colouration
- Show a loss of translucency and be dull or opaque
- Display reduced mobility

Bulging, opacity and immobility are all highly predictive of acute otitis media.

Management of acute otitis media

Reassurance is an important aspect of the management of otitis media. Symptom relief with analgesics and watchful waiting is recommended, as approximately 80% of children with

acute otitis media have spontaneous resolution within two to 14 days.[2] Paracetamol is the first-line analgesic. Ibuprofen is known to reduce inflammation and pain associated with acute otitis media, however, it should not be given if the child displays signs of dehydration or has concurrent asthma (NSAIDs can potentially worsen asthma symptoms). There is no evidence that antihistamines or decongestants provide benefit.[7]

Antibiotics are not routinely required in the treatment of uncomplicated acute otitis media. However, a recent study suggests that empiric antibiotic treatment of acute otitis media in infants can reduce symptoms and decrease the likelihood of persistent infection.[8]

Antibiotic treatment should be considered in children:[7, 9]

- Aged under six months
- Aged under two years, with bilateral acute otitis media or severe illness
- With acute otitis media and perforation
- With systemic symptoms, e.g. fever
- Who have not improved following 48 hours of watchful waiting

When antibiotics are required, first-line treatment is amoxicillin 40 mg/kg/day in two to three divided doses (up to 1.5 g daily), for five days. Treat for seven to ten days in a child aged under two years, with an underlying medical condition, perforated eardrum or chronic or recurrent infections.[7, 10] N.B. Some clinicians are now recommending using amoxicillin 80 mg/kg/day as it is more effective in treating resistant *Streptococcus pneumoniae* strains, however, current guidelines reflect the lower dose. Co-trimoxazole, cefaclor and erythromycin are alternative antibiotics to amoxicillin, although erythromycin would be trialled last as it has poor activity against *Haemophilus influenza*, which is a common pathogen associated with otitis media.[1, 10]

Delayed ("back pocket") prescribing may be appropriate in some cases. Providing a prescription with advice to only use it if the symptoms persist for more than 24 – 48 hours can reduce antibiotic use without reducing family satisfaction with treatment.[7] This can also be written on the prescription in order to allow pharmacists to provide counselling on delayed use when parents request immediate dispensing of antibiotics. Alternatively, the prescription could be dated in advance. The family should be asked to return if the child's condition worsens despite the use of antibiotics, or if they have concerns about the child's health.

Table 1: Patient and environmental factors influencing a child's risk of developing otitis media[4]

Patient-related factors	
Age	Otitis media peaks between ages 6 - 24 months and between ages 4 – 5 years
Reduced breast feeding	Breast feeding for at least three months reduces the rates of acute otitis media by 13%
Premature birth	May increase the risk of otitis media
Use of a dummy (pacifier)	After age 11 months dummy use increases the risk of children developing acute otitis media by 24%
Environmental factors	
Attendance at early childhood care	The most significant environmental factor and directly related to the number of children at each centre
Overcrowded homes and/or a large number of older siblings	As with daycare, relating to increased close contact between siblings
Winter	Upper respiratory tract infections are more common in winter and viruses are often associated with acute otitis media
Passive smoking	Shown to increase the risk of otitis media in children

Otitis media with effusion (OME)

OME is defined as the presence of fluid in the middle ear without signs or symptoms of an infection.[1] It can occur spontaneously, as part of rhinosinusitis, or following an episode of acute otitis media. It is the most frequent cause of balance disorder and acquired conductive hearing loss in childhood.[4, 11]

Following acute otitis media, OME is present in approximately half of patients at one month, 20% of patients at two months and 10% of patients at three months.[12] A study which included tympanometry as part of an assessment of routine development in over 1000 Pacific children, found that at age two years one in four were affected by OME.[11]

Most children with OME will improve spontaneously within three months.[7] There is concern that persistent hearing loss due to OME can affect language development, although no causal relationship has been clearly established.[7]

Diagnosing otitis media with effusion

A diagnosis of OME can be confirmed if pneumatic otoscopy or tympanometry shows reduced or absent tympanic membrane mobility.[5] Other signs include abnormal colouring of the tympanic membrane, e.g. yellow or amber, opacity not due to scarring (which may be present in patients with a history of inner ear issues) or the presence of air bubbles.

Management of otitis media with effusion

Watchful waiting is recommended as most cases of OME resolve spontaneously.[7] Antibiotics provide little or no long-term benefit for children with OME.[13]

Interpretation of tympanometry

Tympanometry allows assessment of middle ear function by measuring tympanic membrane compliance (mobility).

Tympanograms vary between patients, however, there are three broad types of trace that can be used for diagnostic purposes:

1. **The type "A" trace** reflects a normal middle ear mechanism.
2. **The type "B" trace** lacks a sharp peak, suggesting decreased mobility of the tympanic membrane, which may be due to the presence of fluid within the middle ear. Cerumen occluding the ear and grommets can also cause a type "B" trace. In adults, other causes should be considered including tympanic membrane scarring, tympanosclerosis, cholesteatoma and a middle ear tumour.
3. **The type "C" trace** indicates negative pressure within the middle ear space and correlates with a retracted tympanic membrane. This suggests eustachian tube dysfunction or the aspiration of fluid from the nasopharyngeal space into the middle ear, which may result in acute otitis media.

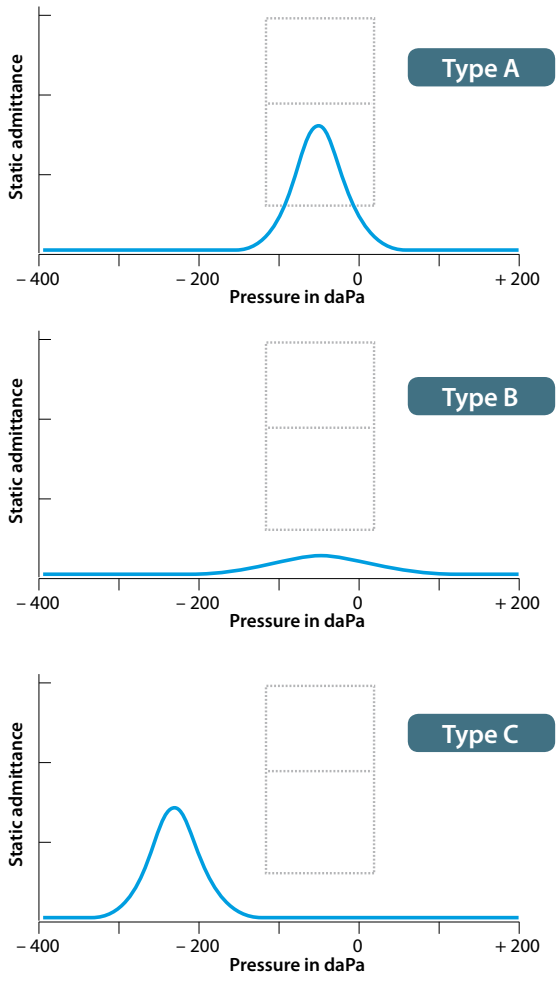

Figure 1: Type "A", "B" and "C" tympanograms adapted from Onusko et al, 2004[6]

Reducing the risk of otitis media-related complications

In New Zealand, there is limited epidemiological data regarding complications associated with otitis media. In Australia, indigenous children, particularly those living in isolated rural communities, are most at risk of complications.[7]

The two most significant modifiable risk factors for otitis media are dummy (pacifier) use after the age of 11 months and passive smoking.[4] Smoking rates are higher amongst Māori and Pacific peoples compared to Europeans in New Zealand, therefore reducing smoking rates is likely to reduce the rate of otitis media in Māori and Pacific children. Breast feeding is thought to protect against the development of otitis media.[4] Teaching and encouraging young children to blow their noses may also assist in routinely clearing the eustacian tubes.

Referral to an otolaryngologist should be considered in children who have recurrent acute otitis media. This is defined as more than three episodes in a six month period, or four times in one year.[14] Grommets have been shown to reduce the incidence of recurrent acute otitis media in the six months following insertion (see "Grommets – indications, outcomes and complications").[15] Referral is also indicated for children with OME and hearing loss lasting longer than three months that has been confirmed by otoscopy or tympanometry.[14]

To confirm hearing loss, a hearing test should be arranged for all children with bilateral OME that persists for longer than three months.[1]

The Kidz First hearing and vision testing service provides a free mobile service to children with high needs within the Counties Manukau region. There are also community-based

Grommets – indications, outcomes and complications

The association between persistent hearing loss caused by OME and adverse language and behavioural outcomes is controversial. Grommets (tympanostomy tubes) are often inserted to restore hearing in children with chronic OME. A Cochrane review found that grommet insertion could improve hearing loss associated with OME in children, however, this effect was limited to six to nine months post surgery, by which time natural resolution also led to improved hearing in non-surgically treated children.[16] The review concluded that a policy of watchful waiting for three months in children with bilateral OME and a hearing impairment is justified, as during this period, approximately 50% of children will experience spontaneous resolution.[16] This guidance is in line with United Kingdom NICE referral guidelines for the surgical management of OME in children.[17] It is also supported by another Cochrane review, which found no clinically significant benefits to language and behaviour outcomes of screening and early treatment of OME in the first four years of life.[18]

Grommet insertion is also used to prevent recurrent acute otitis media. A Cochrane review found that grommet insertion was effective in reducing the frequency of recurrent acute otitis media in the first six months following surgery.[15]

Otorrhoea (discharge) will be experienced by one in four children at some stage while the grommets are in place.[19] In approximately 4% of infants, this complication will develop into chronic suppurative otitis media (CSOM), the most severe form of otitis media.[19] Grommet insertion is a significant cause of CSOM in children, but it can also develop as a complication of acute otitis media with perforation.[20]

A diagnosis of CSOM can be made when there is discharge through a perforated tympanic membrane, which persists for two to six weeks.[1] Topical quinolones are the first-line treatment, as there is a small risk of ototoxicity associated with the use of non-quinolone topical antibiotics such as aminoglycosides.[1] Ciprofloxacin with hydrocortisone ear drops (not subsidised) are effective in treating CSOM. The external auditory canal should be cleaned using suction prior to administration to allow the antibiotic to penetrate affected tissues. Children who fail to respond to topical antibiotics should be referred for more intensive treatment.

clinics in this region. Further information is available from: **www.healthpoint.co.nz**. Similar services also exist in other regions. Local DHBs should be contacted for details.

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Vaccination can protect against otitis media

On 1 July 2011, two new pneumococcal vaccines that could potentially reduce the health burden of otitis media replaced Prevenar (PCV7) on the New Zealand immunisation schedule.[21] The routine immunisation schedule now includes Synflorix which covers ten pneumococcal serotypes and may provide protection against non-typeable *Haemophilus influenzae* (NTHi). NTHi is one of the main bacterial pathogens associated with acute otitis media.[21] Prevenar 13 is available for children at high risk of pneumococcal disease, e.g. immunodeficient or with cochlear implants. These children should also receive the pneumococcal polysaccharide vaccine Pneumovax 23 after age two years.

For further information see: "Pneumococcal vaccine for adults: Pneumovax 23", BPJ 35 (Apr, 2011).

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