Managing acute otitis media
what the GP needs to know

Diagnosis of acute otitis media in the febrile, screaming child may be difficult. Only 40% of children with red tympanic membranes have acute otitis media. When the diagnosis is uncertain, consider supportive treatment for 24 to 48 hours, and prescribe antibiotics only if symptoms persist.

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Acute otitis media is an acute infection within the middle ear, with rapid onset of signs and symptoms, such as otalgia and fever. Affecting 80% of children at least once before the age of 4 years, it accounts for the largest number of antibiotic prescriptions for children, and the second highest number of hospital admissions of children, after asthma.

The sequelae, particularly otitis media with effusion (glue ear), may significantly impact on a child's language and educational development. Social changes, particularly the advent of widespread daycare centre attendance in the last two decades, have led to a mini epidemic of acute otitis media and otitis media with effusion in children attending these centres.

Otitis media should be considered a continuum from acute otitis media and recurrent acute otitis media through to otitis media with effusion. Diagnosis of acute otitis media may be difficult in the absence of definitive symptoms, and the so-called 'red ear' (that is, a red tympanic membrane) accompanied by otalgia is, in fact, acute otitis media in only 40% of cases. It is important to differentiate the management of the red ear that is not otitis media from that of true acute otitis media.

This article outlines the current state of management of children with the red ear and acute otitis media on presentation to the family practitioner, and outlines when referral to an ENT specialist is warranted.

Symptoms and signs

Symptoms

Symptoms of acute otitis media are summarised in Table 1. Patients with the red ear but not otitis media may present similarly, particularly when the red ear is associated with a viral upper respiratory tract infection. In Aboriginal and Torres Strait Islander children with acute otitis media, fever and otalgia may not be as evident, and irritability, malaise and diarrhoea may be the presenting symptoms, particularly in infants.

IN SUMMARY

- **Only 40% of children with 'red ears' have acute otitis media. If a diagnosis of acute otitis media is doubtful consider 24 to 48 hours of conservative management.**
- **Amoxycillin remains the treatment of choice for patients with acute otitis media; if there are resistant organisms higher doses or treatment with amoxycillin/potassium clavulanate or cefaclor may be needed.**
- **Recurrent otitis media (that is, three to four episodes per year) with underlying persistent middle ear effusion warrants insertion of ventilation tubes.**
- **Referral for specialist care and management is warranted for the neonate and young infant with persistent disease, or when there are complications.**

Table 1. Symptoms of acute otitis media

Most common symptoms

Otalgia or pulling of the ear in the younger infant
Irritability
Fever

Other symptoms

Anorexia
Vomiting
Diarrhoea
Otorrhoea

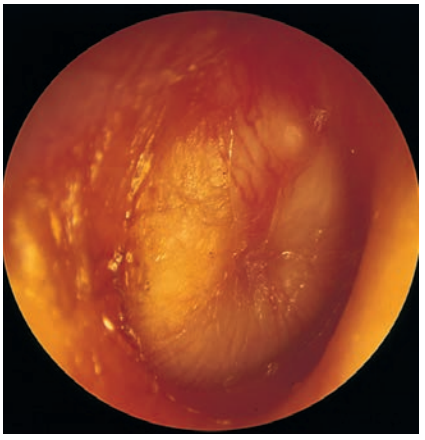


Figure 1. Acute otitis media with bulging tympanic membrane.

PHOTOGRAPH COURTESY OF PROFESSOR BRUCE BLACK, BRISBANE

Signs

To examine a child with acute otalgia, it may be necessary to remove wax, which may occlude the view of the tympanic membrane. The otoscope must have sufficient power to illuminate the tympanic membrane adequately. Patients with acute otitis media have an erythematous and bulging tympanic membrane with loss of visible landmarks (Figure 1), and decreased or absent mobility on pneumatic otoscopy. There may be visible middle ear pus and discharge through a perforation. The differential diagnosis of the red ear includes:

- otitis media with effusion
- otitis externa
- erythema of the tympanic membrane in the screaming or febrile child
- bullous myringitis.

Causes and risk factors

Various environmental and host related factors affect the occurrence of middle ear disease. Host related factors may include sex, age, race, immunologic and allergic factors, congenital head and neck abnormalities, and hereditary factors. Environmental related factors include the season, presence of upper respiratory tract infections, daycare centre attendance, number of siblings, tobacco smoke exposure, duration of breastfeeding and socioeconomic status.[1]

Host related factors

The highest incidence of acute otitis media occurs between the ages of 6 and 12 months, and persistent middle ear effusion is four times as common in children under 2 years of age than in older children. This first peak, following the cessation of breastfeeding or environmental exposure to infections, is followed by a second peak in incidence at about 4 years of age, when children attend preschool.

In some studies boys have been found to have a higher incidence of acute otitis media than girls, and the incidence in Aboriginal and Torres Strait Islander children is higher than that in other Australian children. In some Aboriginal and Torres Strait Islander communities the incidence of recurrent, acute and chronic otitis media is 50% (see the box below for specific information on otitis media in Aboriginal and Torres Strait Islander children).

The role of allergy as a risk factor is controversial, but in my practice more than 75% of children over 5 years of age with middle ear effusions or recurrent acute otitis media, in the absence of a cleft palate or Down syndrome, have historical and clinical features of atopy.

Children with subtle immune deficiencies may be prone to otitis media compared with other children.

Environmental related factors

Acute otitis media often accompanies a viral upper respiratory tract infection, and there is an increase in the number of cases of otitis media in the winter months. There is also a dramatic increase in the number of children with upper respiratory tract infections, recurrent acute otitis media, and otitis media with effusion in children in full time daycare. In one study, 21% of children in full time daycare had ventilation tubes *in situ*, compared with 3% of children cared for at home.[3]

Passive smoking has been implicated, but not conclusively proven, to be a factor in the development of recurrent acute

Otitis media in Aboriginal and Torres Strait Islander children

- By the age of 12 weeks, 90% of all Aboriginal and Torres Strait Islander children have invasive pneumococci in their nasopharynx (the incidence in other children is about 30%).
- Otitis media occurs often before the age of 1 year.
- Symptoms may be confined to general malaise, anorexia and diarrhoea followed by otorrhoea.
- Early antibiotic therapy for acute otitis media may prevent complications and, particularly, the development of chronic otitis media.
- Early insertion of ventilation tubes (grommets) may be needed in patients with recurrent otitis media (three episodes in a six-month period or four episodes in a year with one in the previous six months).[2]

otitis media, whereas breastfeeding has been noted to have a protective effect against middle ear disease.[4]

Children in lower socioeconomic groups with poorer hygiene and nutrition and living in overcrowded conditions have a higher incidence of acute otitis media.

The patient handout opposite provides advice for parents on reducing the risk of otitis media.

MedicineToday PATIENT HANDOUT

Reducing the risk of otitis media: advice for parents

- If possible, continue to breastfeed your child until he or she is 9 to 12 months old. Breastfeeding has been shown to reduce otitis media.
- Avoid 'prop feeding' your baby. This is when your baby is lying flat and his or her bottle is placed vertically or 'propped' up on a pillow. This feeding position increases the risk of otitis media.
- Avoid smoking around the baby. Passive smoking increases the risk of otitis media, as well as asthma and other conditions.
- If possible, reduce the amount of time your child is in full time daycare, or transfer him or her to a family daycare situation.
- Avoid giving your child a dummy after the age of 10 months as this increases the risk of otitis media.
- If your child is in daycare and has recurrent ear infections, he or she may benefit from having pneumococcal and influenza vaccinations.

Bacteriology

The bacteria often implicated in acute otitis media include:

- *Streptococcus pneumoniae*
- *Haemophilus influenzae*
- *Moraxella catarrhalis*
- *Streptococcus pyogenes*
- *Staphylococcus aureus.*

As *S. pneumoniae* produces the most severe symptoms and sequelae, management should be directed towards this particular bacterium. The development of antibiotic resistance by bacteria is a major factor in deciding on the appropriate therapy for the red ear where the possibility of spontaneous resolution exists. Antibiotic resistance may occur in 10 to 30% of cases of pneumococcal infection.

Management of acute otitis media and the red ear

Paracetamol is the drug of choice for pain reduction and fever associated with the acute infection. An NSAID, such as ibuprofen, may be an acceptable alternative, and in some children a paracetamol and codeine mixture may be necessary for more severe pain.

With a definitive diagnosis of acute otitis media, a broad-spectrum oral antibiotic, such as amoxycillin, is the drug of choice. Although a dosage rate of 40 mg/kg/day in three divided doses has been suggested previously, recent studies have shown that 90 mg/kg/day may be necessary in the more severe cases.[5]

Amoxycillin-resistant *S. pneumoniae* may be suspected because of geographic trends or daycare attendance, or if there is no clinical improvement after 48 hours of amoxycillin treatment, as evidenced by persistent otalgia, fever or complications.[5] In such cases, second line drugs, such as amoxycillin/potassium clavulanate (Augmentin, Ausclav, Clamoxyl, Clavulin) or cefaclor, may be appropriate.

For patients who are allergic to penicillin (including amoxycillin), roxithromycin (Biaxsig, Rulide) or azithromycin (Zithromax) may be considered. The rate of resistance of the pneumococcus to sulfamethoxazole with trimethoprim is high, and this antibiotic should not be considered when there is penicillin allergy. Cefaclor has poor activity in the middle ear against *H. influenzae*, and should be used with caution because of the risk of a serum sickness-like reaction.[6]

When there is high diagnostic uncertainty of acute otitis media (that is, in patients with the red ear) and the child is over 2 years of age, consider giving supportive management only for 24 to 48 hours. If the condition worsens, then appropriate antibiotics may be dispensed. The rationale for this management in older children with questionable acute otitis media diagnosis and nonsevere symptomatology relates to the favourable natural history of untreated acute otitis media. In these cases, the rate of spontaneous resolution within two to three days of onset is close to 87%.

This questioning of the routine prescribing of antibiotics relates not only to possible incorrect diagnosis of the red ear and spontaneous resolution of the otitis media, but also to concerns about the development of drug resistant bacteria in the community and complications due to the antibiotics used.

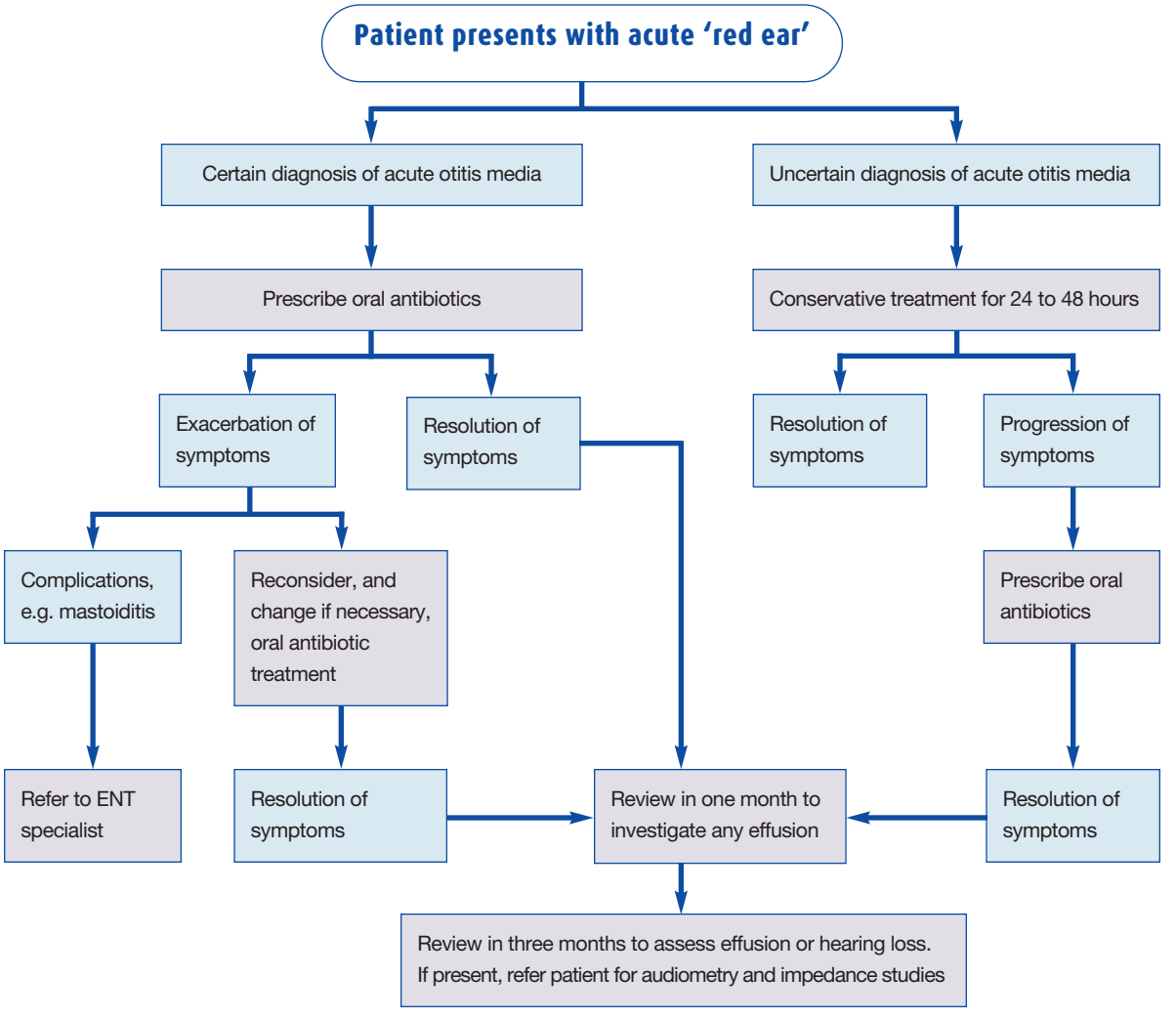
With respect to children younger than 2 years with the red ear, because of their higher risk of developing infections and the higher incidence of complications, antibiotic therapy may be prescribed with a lower index of suspicion.

The duration of oral antibiotic therapy has been controversial, but seven to 10 days is accepted practice. Antihistamines, decongestants and antibiotic eardrops are not indicated in patients with uncomplicated acute otitis media.

The child with acute otitis media should be reviewed one month after the original infection to assess whether any middle ear effusion has resolved, and then again at three months if resolution has not occurred after one month. At this time, audiometry and tympanometry are advisable if effusion is still present.

continued

Managing patients with 'the red ear' and acute otitis media



Referral to a specialist is indicated if there is a significant (that is, greater than 25 dB) hearing loss with associated speech and language delay.

The flow chart above summarises the management of the red ear and acute otitis media.

Otorrhoea

Otorrhoea occurs when the tympanic membrane ruptures, which is usually associated with pain relief. Although some authors recommend no treatment of the otorrhoea, apart from the continuation of systemic antibiotics, management with topical antibiotic/corticosteroid combination eardrops may help resolve the otorrhoea and reduce the risk of secondary otitis externa.

Non-ototoxic fluoroquinolone topical antibiotic eardrops have become the treatment of choice for patients in whom there is otorrhoea with the potential entry of the drops into the middle and inner ear.

Despite prescribing information citing that a contraindication for the use of topical eardrops is the presence (or suspected presence) of a perforation of the tympanic membrane, most otologists prescribe eardrops for persistent otorrhoea. The dosage of antibiotic/corticosteroid eardrops (e.g. ciprofloxacin/hydrocortisone ear drops [Ciproxin HC Ear Drops]) should be three drops twice daily for three to five days.

Four potential sequelae can occur following acute otitis media with perforation as listed below:

Table 2. Investigations for recurrent otitis media

Audiometry and tympanometry
Used to assess hearing and the presence of underlying middle ear effusion.

Sinus x-rays
Used to rule out maxillary sinusitis, especially when an allergic background is suspected or the patient has frequent 'colds'.

Allergy testing
To investigate whether other respiratory factors, such as asthma or hay fever, coexist.

Immune studies
Performed in patients with recurrent otitis media or persistent otorrhoea after grommet insertion.

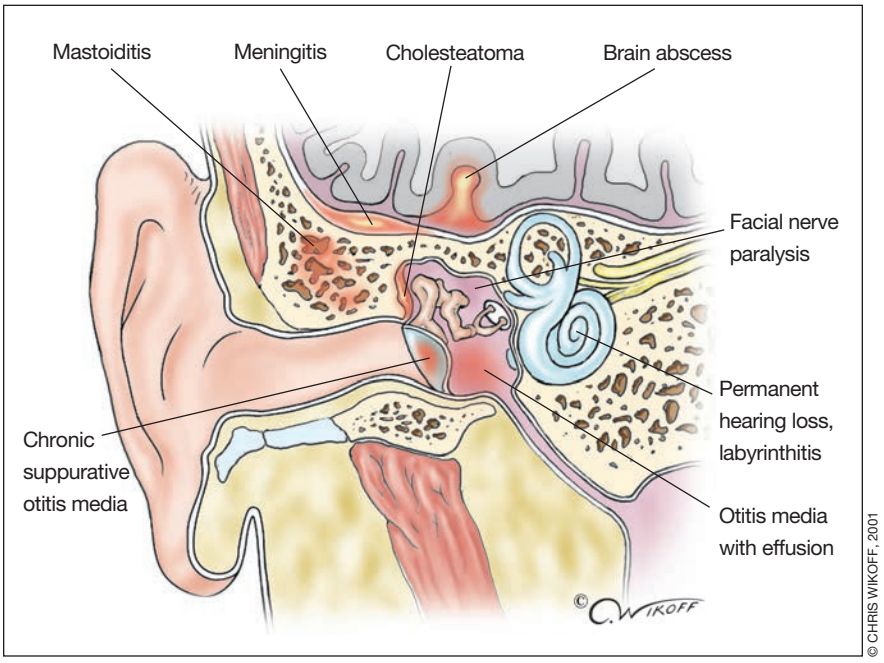


Figure 2. Complications of acute otitis media.

- resolution of the process and healing of the tympanic membrane
- resolution of the acute otitis media with chronic tympanic perforation development
- persistence of both the otitis media and perforation (chronic suppurative otitis media)
- development of an acute suppurative complication of otitis media.

Recurrent acute otitis media

Recurrent otitis media is defined as three acute otitis media attacks in the previous six months or four attacks in 12 months with one in the previous six months;[7] it is experienced by 3 to 17% of children.[8]

There are two patterns of recurrent acute otitis media. The first is characterised by discrete episodes of otitis media, often accompanying an upper respiratory tract infection, which resolve completely between attacks. The second is recurrent otitis media superimposed on a persistent middle ear effusion.

A search for risk factors in patients with recurrent acute otitis media may reveal sinusitis, allergic rhinitis, attendance at daycare, or structural abnormalities, including cleft palate (overt or submucous) or Down syndrome. Occasionally, an immune deficiency may be the cause; this is often the case when there is persistent otorrhoea following ventilation tube insertion for recurrent otitis media.

Table 2 summarises the investigations used to investigate patients with recurrent otitis media.

Management of recurrent otitis media

The management of recurrent otitis media is contentious.

On one hand, prophylactic antibiotics have been effective in reducing episodes of otitis media in children with recurrent disease by 40 to 90%.[9,10] The dosage schedules of these prophylactic regimens

Consultant's comment

The management of otitis media is controversial. There are often differing opinions between medically orientated and surgically orientated practitioners. As occurs in many other situations, there are radicals at both extremes. The middle ground is most often the most practical and commonsense approach.

The article gives a good practical approach to a very common problem. The treatment regimen proposed in this article will result in very good patient care, which is the ultimate goal.

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are half the therapeutic doses of either amoxycillin 20 mg/kg/day or trimethoprim/sulfamethoxazole 50 mg/kg/day for one to three months. Severe neutropenia may occur with prolonged use of trimethoprim/sulfamethoxazole. Drug allergy will occur in 1 to 6% of antibiotic-treated patients with severe reactions, such as anaphylaxis or serum sickness, occurring in 0.1 to 0.5% of patients. In patients in whom compliance with oral antibiotic therapy is unlikely, either a single dose of ceftriaxone (Rocephin) intramuscularly, equivalent to 10 days of oral amoxycillin, or procaine penicillin (Cilicaine Syringe) intramuscularly once daily for five days may be substituted.

On the other hand, there are concerns that low concentrations of an antibiotic may permit colonisation by resistant strains of bacteria. The Australian *Therapeutic guidelines: antibiotics* and many clinical microbiologists recommend against the use of prophylactic low dose antibiotic regimens for recurrent acute otitis media.[11] When there are four episodes of acute otitis media in six months, or six in a year, consideration of insertion of ventilation tubes as prophylaxis for recurrent acute otitis media should be made.[12]

In the child in whom there is an underlying otitis media with effusion with recurrent infection, insertion of ventilation tubes to clear the underlying effusion and hearing loss and to prevent the recurrent otitis media is the treatment of choice.

Complications of acute otitis media

As illustrated in Figure 2, the major complications that may arise from acute otitis media are:

- acute mastoiditis (although uncommon today, with only one or two cases per 1000 children treated, this complicated up to 20% of cases of acute otitis media during the pre-antibiotic era)
- facial paralysis
- labyrinthitis
- chronic suppurative otitis media
- otitis media with effusion
- cholesteatoma
- meningitis
- brain abscess
- sensorineural hearing loss.

Fortunately, with the exception of otitis media with effusion and chronic suppurative otitis media (in Aboriginal and Torres Strait Islander children), the complications of acute otitis media are uncommon.

Otitis media with effusion is often seen after management for acute otitis media. Two weeks after therapy, 63% of children will have persistent middle ear effusion, and one month after the attack, 40% will still have middle ear effusion, decreasing to 26% after three months. The chance of spontaneous resolution of persistent middle ear effusion after three to six months is reduced. Initial antibiotic therapy has not been shown to decrease the prevalence of otitis media with effusion after an episode of acute otitis media.[13,14]

When to refer

Patients should be referred to an ENT specialist in the following cases:

- persistent acute otitis media in a neonate or young infant, or when complications, such as mastoiditis, are suspected (the child suspected to be immunocompromised falls into this category)
- persistent otorrhoea after one week of adequate therapy
- suspected presence of other complications, including facial paralysis, labyrinthitis, meningitis, or brain abscess
- recurrent acute otitis media with four separate attacks in six months or six in a year, or the presence of middle ear effusion for three months or longer with hearing loss, balance problems or speech and language delay
- suspected cholesteatoma.

The future

Pneumococcal polysaccharide vaccines are effective in preventing type-specific pneumococcal acute otitis media, particularly in children over the age of two years. New seven-valent pneumococcal conjugated vaccines are available in Australia (Prevenar) and hold reasonable promise to reduce the incidence of acute otitis media, particularly in children at high risk, such as young children attending daycare centres.

There is evidence that daycare children receiving influenza vaccine show a decreased incidence of acute otitis media.[15] In addition, research into a non-typable *H. influenzae* vaccine is continuing overseas. MT

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A list of references is available on request to the editorial office.

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