

When is it Safe not to Treat Acute Otitis Media with Antibiotics?

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Acute otitis media (AOM) is one of the most common childhood illnesses and the most common conditions requiring antibiotics. It is estimated that up to 80% of children will have had at least one episode of otitis media by the age of 3 years. Over time, the practice of universally prescribing antibiotics for all patients with acute otitis media has been called into question and there are numerous controversies regarding whether or not it is safe to treat acute otitis media without antibiotics. This article aims to elucidate the data and describe the current best practices.

AOM is defined as the presence of middle ear fluid associated with an acute onset inflammatory response, associated with a bulging eardrum, otalgia or fever. In neonates, poor feeding, apneas or irritability may be associated symptoms. Pneumatic otoscopy plays a crucial role in the accurate diagnosis of acute otitis media. It is important to differentiate acute otitis media from otitis media with effusion (OME), which is defined as the presence of fluid in the middle ear without an inflammatory response.

Common bacterial pathogens in AOM are *Streptococcus pneumoniae*, *Hemophilus influenzae* and *Moraxella catarrhalis*. Viral respiratory pathogens including rhinovirus, RSV, adenovirus, enterovirus, coronavirus and parainfluenzae are also common causes of acute middle ear disease.

Young children between six months and two years more commonly suffer from middle ear infections than adults due to the developing anatomy of the Eustachian tube and an immature immune system.

Certain children with congenital abnormalities are predisposed to developing acute otitis media. These include cystic fibrosis, neuromuscular abnormalities, mid facial hypoplasia, immunological disturbance and those with patulous Eustachian tubes.

Other risk factors associated with AOM are genetic predisposition, male, lower socioeconomic status, family history, passive smoking, pacifier use and having other siblings in the household. Breast-feeding has been shown to be preventative.

Why should AOM not be treated with antibiotics?

For many children AOM resolves spontaneously after 2-3 days. These children will not require antibiotics.^{1,2} Also the cost of antibiotics, antibiotic resistance and adverse effects argue for a more judicious approach to antibiotic prescription: Data from the United States estimate that the direct health care cost of treating AOM is over two billion dollars per year³ and there are similar estimates of costs in other countries.⁴

There are concerns of evolving drug resistance due to antibiotic use. The emergence of resistant bacteria is directly proportional to the amount of antibiotics used.⁵

Adverse effects of antibiotics including allergic reactions and gastrointestinal complications will affect at least 5-10% of patients. Antibiotics can disrupt the normal microbiota, leading to diarrhea and nutritional malabsorption.

What are the management options for the child with AOM?

As otalgia is a key feature of AOM, adequate prescription of analgesia is important in the early management of the disease. Paracetamol and ibuprofen for mild to moderate pain are usually adequate. If this is not sufficient narcotic analgesia may be considered.^{1,6}

Certain patients can be treated on an expectant basis without antibiotics

McCormick *et al.* published a randomized control trial that compared the outcomes of observation versus immediate antibiotic treatment in children less than 12 years with non-severe otitis media. In the observation group, 66% recovered without the requirement of antibiotics. The group who received immediate antibiotics had improved symptom control, but a higher percentage carried strains of multi-resistant bacteria and 12% suffered from an adverse event related to antibiotics. There was no increase in the number of severe complications between the two groups of patients. At 30 days there was no significant difference in the outcome for the patient.⁷

Contrary to this, Tahtinen *et al.* published a randomized control trial that assessed the efficacy of amoxicillin-clavulante for 7 days versus placebo in children aged 6-35 months. There was a considerable difference in treatment failures; 18.6% of antibiotic group compared to 44.9% of the placebo group. To avoid a treatment failure in 1 child 3.8 children needed to be treated. However there were adverse effects in the treatment group with 47.8% experiencing diarrhea compared to 26.6% in the placebo group. There were no cases of mastoiditis in either group. This study suggests that antibiotic treatment is superior to placebo in treating acute otitis media, reducing the duration of the illness. But there were also a significant number of children who improved without antibiotics.⁸

Hoberman *et al.* published a similar study prescribing a 10-day course of antibiotics in children aged 6-23 months. The group treated with antibiotics had a faster recovery and a reduced rate of persistent acute infection on otoscopy.⁹

A wait-and-see prescription is an alternative option and a balance between immediate antibiotics and strict follow-up. Spiro *et al.* conducted a randomized control trial on 283 children between 6 months and 12 years with AOM. All patients were given oral analgesia and otic analgesic drops. Patients were then randomized to a standard prescription of antibiotics or a wait-and-see prescription. If the child had worsening symptoms or was not improving the prescription could be filled. Only 38% of patients filled the prescription, usually because the child continued to have otalgia and fever. Overall there was a slight reduction in duration of otalgia (about 10 hours) in the antibiotic group, but also a 2 to 3-fold increase in the rates of diarrhea in this group.¹⁰

When to withhold antibiotics and when not?

The American Guidelines for management of otitis media which many practitioners now follow, were revised in 2013.^{1,6} ***A period of watchful waiting is recommended in patients with uncomplicated AOM, children over 2 years of age, no features of a severe illness and if there is uncertainty about the diagnosis.***

The child must have a reliable caregiver and the clinician must arrange follow-up after 24-72 hours or provide a prescription for the parent to use, if the child fails to improve.^{1,6}

First-line treatment with ***amoxicillin***, covering most strains of pneumococcus, using a dose of 80-90 mg/kg per day in 2 divided doses is recommended. ***If ineffective*** or in patients with severe illness additional coverage is advised. High dose therapy with ***amoxicillin-clavulanate*** (90mg/kg per day amoxicillin and 6.4mg/kg/day clavulanic acid) ***should be considered.***^{1,6}

Pichichero *et al.* reviewed the literature and found a slightly improved clinical outcome in children receiving amoxicillin for 10 days, but there was a much higher incidence of gastrointestinal upset. It is recommended that children under the age of 2 receive a 10-day course of antibiotics. Older children may receive adequate treatment with a shorter course of 5-7 days.¹¹

In penicillin allergy alternative options are cephalosporins, trimethoprim-sulfamethoxazole, macrolides or clindamycin.

Is surgery an alternative to antibiotics?

Tympanocentesis can improve symptoms and has been said to be useful to obtain a specimen for diagnostic microscopy and culture. However, most practitioners infrequently use it.

Tympanostomy tubes can be considered in children with recurrent AOM. They have been shown to prevent future episodes of AOM and aid in the reduction of systemic antibiotic use¹². This is most important in children with cleft palate and Down syndrome who often have Eustachian tube dysfunction and are at high risk for OME and AOM.^{13,14,15,16}

Does a reduction in antibiotic use lead to more severe complications of AOM?

Mastoiditis is a severe complication of AOM, but other complications include subperiosteal abscess, venous sinus thrombosis and meningitis. The fear of these severe complications might prompt the use of antibiotics in AOM, ***but there is no evidence that withholding antibiotics leads to an increased risk of complications.***

A recent study including over 19000 children found that 27.3% under the age of 5 had at least one episode of AOM per year. Antibiotics were prescribed in 51% of cases¹⁷. This was a significant reduction in antibiotic use compared to data for a similar cohort published by Tilyard *et al.*¹⁸, reporting rates of antibiotic prescribing for AOM to be 96.6% over 20 years earlier. Rates of hospital admission for mastoiditis were compared, and there was no increase in the rates of mastoiditis since the reduction in antibiotic prescribing for AOM.¹⁷

A recent publication by Grossman *et al.* reviewed all mastoiditis admissions for children aged 6 months to 14 years across seven hospitals between 2007 and 2012. Of 512 cases with mastoiditis 42.1% also had AOM. Of these patients with AOM, 73% had received immediate antibiotics and 27% had had delayed antibiotic treatment. Patients who received immediate antibiotic therapy were more likely to require surgery and also had a higher incidence of subperiosteal abscess or venous sinus thrombosis than those who received delayed antibiotic therapy. It was concluded that withholding antibiotics was not associated with increased severity of mastoiditis.¹⁹

What is on the horizon?

Pneumococcal conjugate vaccination and influenza vaccination are now recommended and may swing the management of AOM further towards withholding antibiotics in the future.⁶

Our management approach based on the current literature**Watchful waiting:**

1. Uncomplicated AOM in children over 2 years
2. No features of a severe illness and uncertainty about the diagnosis
3. Reliable caregiver

All patients should be given analgesics. A follow-up after 24-72 hours or a 'watch-and-wait' prescription for the reliable parent to use, if the child fails to improve is important.

Antibiotics when

1. Patients under two years of age
2. Severe disease: temperature above 39°C, severe or persistent otalgia
3. History of febrile seizures
4. Inability to return to hospital if needed or poor access to health care facilities
5. Significant medical comorbidities such as cystic fibrosis, immunological dysfunction and cardiac valvular disease

Surgery

Tympanostomy tubes in recurrent acute otitis media

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