Acute Otitis Media (AOM) — Symptoms and Treatment

Acute otitis media (AOM) is an acute inflammation of the middle ear due to viral or bacterial infections. The condition is common in young children aged 6 to 18 months. Patients present with fever, symptoms of upper respiratory tract infection, and ear pain. Treatment consists mainly of broad-spectrum antibiotic therapy. Cases that are unresponsive to antibiotic therapy need tympanocentesis to sample the middle ear effusion and perform a culture and sensitivity test.

Definition of Acute Otitis Media

AOM is defined as an acute inflammation of the middle ear. The condition is associated with symptoms and signs suggestive of inflammation. AOM has a maximum duration of three weeks of semiology; this differentiates it from chronic otitis media.

Epidemiology of Acute Otitis Media

AOM is a very common condition, particularly among young children. Most studies estimate that 70% of all children younger than 2 years of age will develop the condition at least once. Other studies estimate its incidence at approximately 79% per year.

AOM is most common among children aged 3 to 18 months, peaking between the ages of 6 and 11 months. For unclear reasons, the incidence of AOM is slightly higher in boys than girls.
Adenoidectomy is efficacious in older children (4–8 years old) who suffer persistent events of otitis media after tympanostomy tubes have been extruded. Although the reason for this efficacy remains unclear, it seems that the removal of lymphoid tissue from near the eustachian tube orifice may result in improved middle ear ventilation or the eradication of an important source of infection.

Infants who develop otitis media very early in life are considered as otitis-prone and are at risk of developing recurrent AOM later in life. The condition is also clearly affected by race, with a higher incidence among Native Americans and Inuits. Additionally, African-American children have a lower incidence of AOM compared with white children.

### Etiology of Acute Otitis Media

Different etiologies have been associated with AOM; these can be separated into viral and bacterial pathogens. AOM is, therefore, an inflammatory condition of the middle ear that has an infectious etiology.

Viral agents that can cause AOM include the respiratory syncytial virus, which is also associated with bronchiolitis and pneumonia. Respiratory syncytial virus infection has also been associated with a long-term risk of respiratory complications, including asthma.

Pathogenic bacterial infections of the middle ear are found to be the cause of AOM in at least 50% of cases. Different organisms have been identified, namely *Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis,* and *Streptococcus pyogenes.* *S. pneumoniae* is considered to be the most common etiology of AOM regardless of age and is responsible for at least 50% of cases.
Approximately 20% of cases are caused by *Haemophilus influenzae*. While *S. pneumoniae* can be identified in virtually any age group of AOM patients, *H. influenzae* is thought to be more common among older children and those with recurrent AOM.

*M. catarrhalis* is thought to be associated with viral AOM since the bacterium was found to have an interaction with different viral agents known to cause AOM.

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<th>Pathogen</th>
<th>Symptoms</th>
<th>Persistence</th>
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<td><em>S. pneumoniae</em></td>
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<td><em>H. influenzae</em> (non-typable)</td>
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<td><em>M. catarrhalis</em></td>
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Finally, *S. pyogenes* is the fourth most common cause of bacterial AOM. Due to the introduction of penicillins, however, *S. pyogenes* cases of otitis media and associated complications are declining.

While these bacterial and viral pathogens are known to cause AOM in healthy children, certain risk factors are known to be associated with increased severity of the condition or an increased risk of recurrent AOM. Premature birth, a family history of AOM, certain races, people with craniofacial anomalies, and immunocompromised children are considered to be otitis-prone—that is, more likely to develop the recurrent disease later in life.

**Pathophysiology of Acute Otitis Media**

The different viral and bacterial agents associated with AOM are responsible for acute inflammation of the nasopharynx and the eustachian tube. This is associated with increased pressure in the middle ear and stasis. Viral inflammation is likely the first step in the pathology and is then followed by bacterial colonization due to stasis.

Our current understanding of AOM allows us to theorize that a viral infection of the middle ear is not sufficient to cause the symptoms and signs of this condition. Secondary bacterial infection of the middle ear is the most likely cause of the semiology of AOM.
Clinical Presentation of Acute Otitis Media

The symptoms of AOM in neonates are different from those observed in older children. Neonates usually present with non-specific symptoms such as irritability, feeding difficulties, and/or lethargy. Infants and older children complain of fever and exhibit symptoms of an upper respiratory tract infection, pain in the ear, and ear tugging.

Children with this condition are prone to hearing difficulties and conductive hearing loss. Ear stuffiness, pain, and the presence or absence of fever are common findings in older children with AOM.

Perhaps the most important tool to diagnose AOM is physical examination with pneumatic otoscopy. The direct visualization of the tympanic membrane allows for the demonstration of definite signs of AOM. These include reddening, tympanic membrane bulge, and possible tympanic membrane discharge.

Immunocompromised children do not exhibit the typical picture of AOM on pneumatic otoscopy. Instead, they appear septic, and their otoscopy shows serous or watery discharge. The threshold to diagnose AOM in these children should be low, and such findings are usually enough to make the diagnosis.

Once tympanic membrane perforation occurs, patients usually describe a sudden improvement, after which their fever subsides. The most common sign of acute tympanic membrane perforation is purulent ear discharge.

Diagnostic Workup for Acute Otitis Media

Patients who present with an uncomplicated picture of AOM should be treated empirically. Those who develop tympanic membrane perforation, a common symptom, should undergo culture and sensitivity testing of the purulent discharge.

Patients who develop a high-grade fever, become confused, or develop focal neurological signs may have developed an intracranial abscess or venous thrombosis. Such patients
can benefit from a computerized tomography scan of the head.

Neonates, the immunocompromised, and patients with no response to antibiotic treatment should undergo tympanocentesis. This procedure allows for the collection of middle ear aspirate for culture and sensitivity testing. A small needle is introduced through the tympanic membrane, creating a small hole in the tympanic membrane. The procedure is not associated with any significant complications because the hole usually completely heals in 1 or 2 days.

Prevention of Acute Otitis media

Otitis media occurs when a child’s eustachian tube becomes swollen or blocked and traps fluid in the middle ear. The trapped fluid can become infected by pathogens. In young children, the eustachian tube is shorter and more horizontal than it is in older children and adults. This makes it more likely to become infected.

There are several reasons for the blockage of the eustachian tube, including:

- Allergies
- Cold
- Flu
- Sinus infection
- Infected or enlarged adenoids
- Cigarette smoke
- Drinking while lying down (in infants)

Treatment of Acute Otitis Media

The mainstay treatment of AOM is empirical antibiotic therapy. Amoxicillin or erythromycin-sulfisoxazole are considered to be first-line therapy for AOM in children.

Children who do not respond to antibiotics after 48 hours of therapy initiation may have a resistant organism. In this group of children, tympanocentesis should be used to allow for the identification of the infecting organism and to define its antibiotic-sensitivity profile.

Children with confirmed \textit{S. pneumoniae} infection can receive ceftriaxone, cefotaxime, or rifampin. The use of amoxicillin combined with clavulanic acid is usually effective in the treatment of \textit{H. influenzae} otitis media. \textit{M. catarrhalis} is usually sensitive to macrolides and cephalosporins.

References


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