

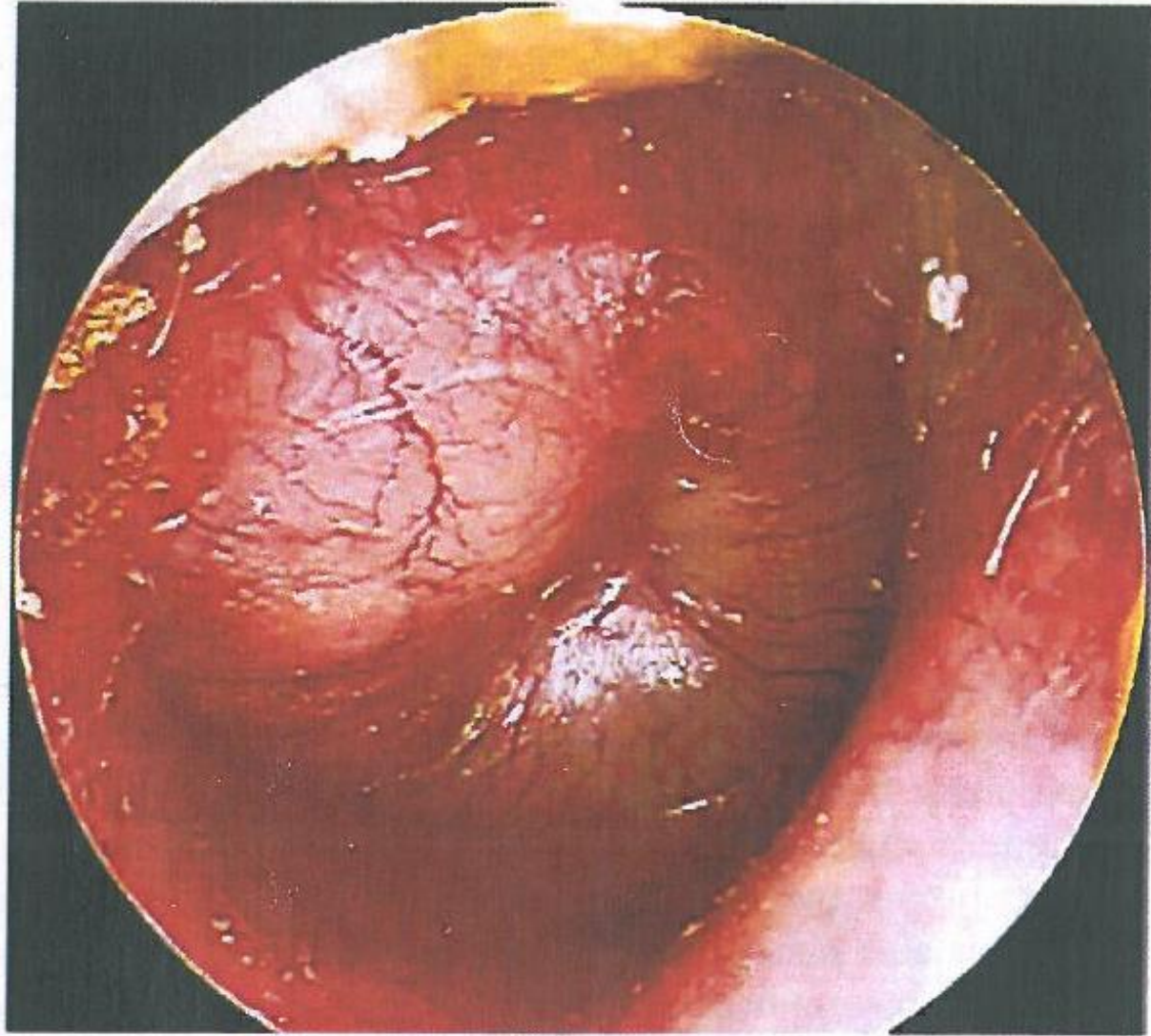
Otitis Media



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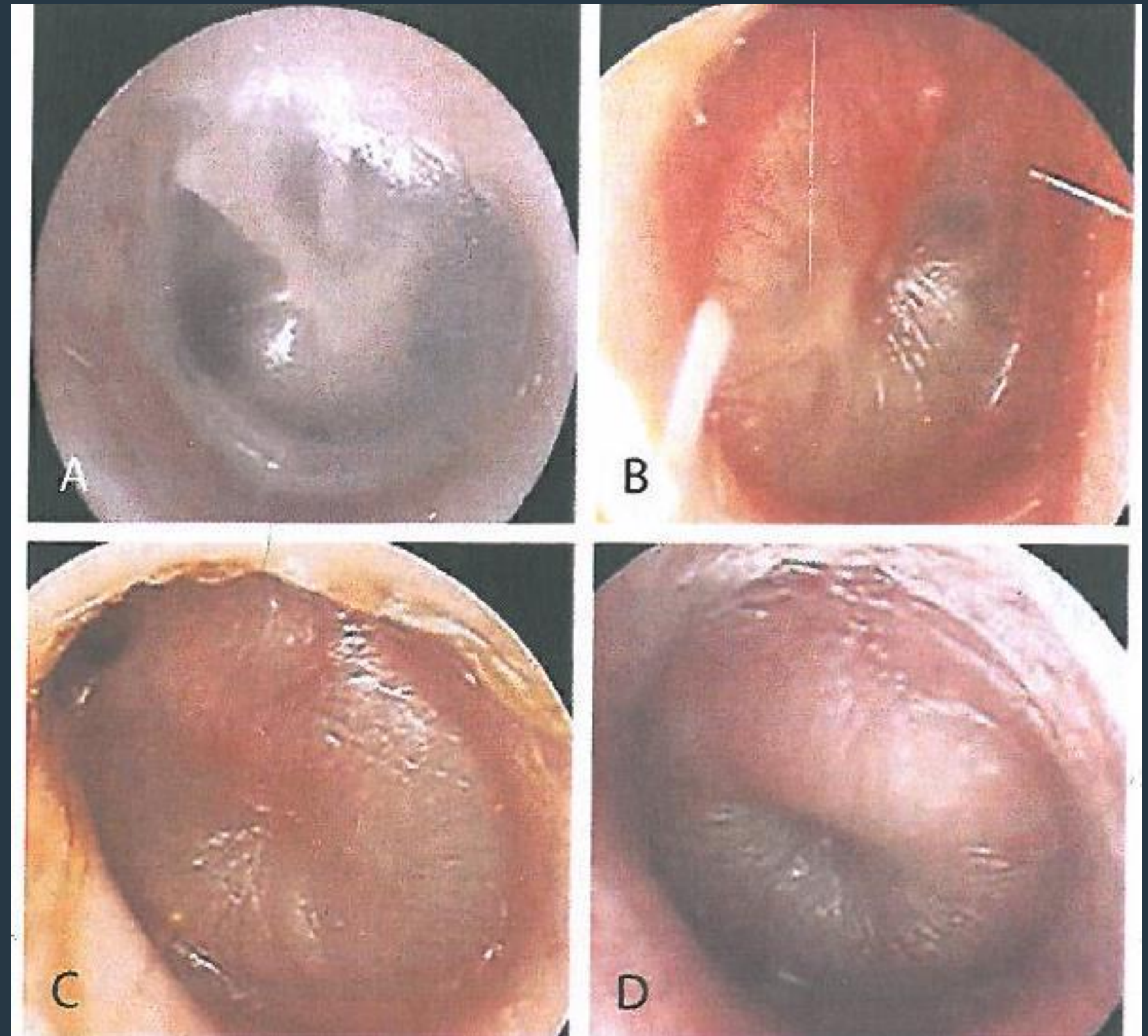
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Otitis media

The term otitis media (OM) has two main categories: acute infection, which is termed suppurative or acute otitis media (AOM), and inflammation accompanied by middle-ear effusion (MEE), termed nonsuppurative or secretory OM, or otitis media with effusion (OME). These two main types are interrelated: acute infection usually is succeeded by residual inflammation and effusion that, in turn, predispose children to recurrent infection. MEE is a feature of both AOM and OME and is an expression of the underlying middle-ear mucosal inflammation. MEE results in the conductive hearing loss associated with OM, ranging from none to as much as 50 dB of hearing loss (moderate hearing loss).

The peak incidence and prevalence of OM are during the first 2 years of life.



OM is also the most common cause of acquired hearing loss in children. OM has a propensity to become chronic and recur. The earlier in life a child experiences the first episode, the greater the frequency of recurrence, severity, and persistence of MEE.



EPIDEMIOLOGY

Several factors affect the occurrence of OM, including age, gender, genetic background, socioeconomic status, breast milk feeding, degree of exposure to tobacco smoke, degree of exposure to other children, presence or absence of respiratory allergy, season of the year, and pneumococcal vaccination status. Children with certain types of immune deficiencies and congenital craniofacial anomalies (i.e., cleft palate, Down syndrome) are particularly prone to OM.

Age

rates are highest at 6-20 months of age. **Gender** OM greater in males than in females

Genetic Background

OM is especially prevalent and severe among Native American, Inuit, and Indigenous Australian children.

Socioeconomic Status

Elements contributing to the association of poverty with OM include crowding, limited hygienic facilities, suboptimal nutritional status, limited access to medical care, and limited resources for complying with prescribed medical regimens.

Breast Milk Compared with Formula Feeding

Most studies have found a protective effect of breast milk feeding against OM

Exposure to Tobacco Smoke

Exposure to other Children

Season

Congenital Anomalies

Other Factors

ETIOLOGY

Acute Otitis Media

Pathogenic bacteria can be isolated by standard culture techniques from middle-ear fluid in most documented AOM cases. Three pathogens predominate in AOM: *Streptococcus pneumoniae*



Nontypeable *Haemophilus influenzae* and *Moraxella catarrhalis*. The overall incidence of these organisms has changed with the use of the conjugate pneumococcal vaccine. Wide-spread use of the expanded serotype coverage 13-valent as compared with the 7-valent pneumococcal conjugate vaccine has further reduced the prevalence of *S. pneumoniae* as a cause of AOM, particularly the virulent 19A serotype. Less common pathogens include group A streptococcus, *Staphylococcus aureus*, and gram-negative organisms. Gram-negative organisms and *S. aureus* are found most commonly in neonates and very young infants who are hospitalized.

Respiratory viruses may also be identified in MEES of children with AOM, either alone or, more commonly, in association with pathogenic bacteria. Of these viruses, rhinovirus and respiratory syncytial virus (RSV) are found most often

Using standard culture techniques, the pathogens typically found in AOM are recoverable in only 30% of children with OME. However, using polymerase chain reaction (PCR), MEES contain evidence of bacterial DNA and viral RNA in much larger proportions of these children. Biofilms of pathogenic bacteria are present on the middle- ear mucosa and adenoid pad in most children with chronic OM.

Otitis Media with Effusion

PATHOGENESIS

A multifactorial disease process, risk profile, and host-pathogen interactions play important roles in the pathogenesis of OM. Such events as alterations in mucociliary clearance through repeated viral exposure experienced in daycare settings or through exposure to tobacco smoke may tip the balance of pathogenesis in less virulent OM pathogens in their favor, especially in children with a unique host predisposition.

Children with craniofacial abnormalities experience an increased incidence of OM associated with the abnormal eustachian tube function. In children with cleft palate, where OM is a universal finding, a main factor underlying the chronic middle-ear inflammation appears to be impairment of the opening mechanism of the eustachian tube. Possible factors include muscular changes, tubal compliance factors, and defective velopharyngeal valving, which may result in disturbed aerodynamic and hydrodynamic relationships in the nasopharynx and proximal portions of the eustachian tubes. In children with other craniofacial anomalies and with Down syndrome, the high prevalence of OM has also been attributed to structural and/or functional eustachian tubal abnormalities.

Host Factors

The effectiveness of a child's immune system in response to the bacterial and viral infections of the upper airway and middle ear during early childhood probably is the most important factor in determining which children are otitis prone. The maturation of this immune system during early childhood is most likely the primary event leading to the decrease in incidence of OM with increased age. Immunoglobulin A (IgA) deficiency is found in some children with recurrent AOM, but the significance is questionable; many children with IgA deficiency do not experience recurrent episodes of AOM. Selective immunoglobulin G (IgG) subclass deficiencies despite normal total serum (IgG) may found in children with recurrent AOM in association with recurrent sinopulmonary infection, and these deficiencies probably underlie the susceptibility to infection.

Host Factors

Children with HIV infection have recurrent and difficult-to-treat episodes of AOM in the first and second year of life. Children with recurrent OM that is not associated with recurrent infection at other anatomic sites rarely have a readily identifiable immunologic deficiency. Evidence that subtle immune deficits play a role in the pathogenesis of recurrent AOM is provided by studies involving antibody responses to various types of infection and immunization; by the observation that breast milk feeding, as opposed to formula feeding, confers some protection against the occurrence of OM in infants with cleft palate; and by studies in which young children with recurrent AOM achieved a measure of protection from intramuscularly administered bacterial polysaccharide immunoglobulin or intravenously administered polyclonal immunoglobulin. This evidence, along with the documented decrease in incidence of upper respiratory tract infections and OM as children's immune systems develop and mature, is indicative of the importance of a child's innate immune system in the pathogenesis of OM .

Viral Pathogens



Although OM may develop and persist in the absence of apparent respiratory tract infection, many, if not most, episodes are initiated by viral or bacterial upper respiratory tract infection. Among children in group daycare, AOM was observed in approximately 30-40% of children with respiratory illness caused by RSV ,influenza viruses ,or adenoviruses ,and in approximately 10-15% of children with respiratory illness caused by para influenza viruses ,rhinoviruses ,or enteroviruses .Viral infection of the upper respiratory tract results in release of cytokines and inflammatory mediators, some of which may cause eustachian tube dysfunction.

Respiratory viruses also may enhance nasopharyngeal bacterial colonization and adherence and impair host immune defenses against bacterial infection.

CLINICAL MANIFESTATIONS

Symptoms of AOM are variable, especially in infants and young children. In young children, evidence of ear pain may be manifested by irritability or a change in sleeping or eating habits and, occasionally, holding or tugging at the ear. Pulling at the ear alone has a low sensitivity and specificity. Fever may also be present and may occasionally be the only sign. Rupture of the TM with purulent otorrhea is uncommon. Systemic symptoms and symptoms associated with upper respiratory tract infections also occur; occasionally there may be no symptoms, with the disease having been discovered at a routine health examination. The Acute Otitis Media Severity of Symptom (AOM-SOS) scale is a five-item validated symptom score that has proven beneficial as a tool to monitor AOM symptoms in patients and studies of antimicrobial effectiveness in OM. OME often is not accompanied by overt complaints of the child but can be accompanied by hearing loss. This hearing loss may manifest as changes in speech patterns but often goes undetected if unilateral or mild in nature, especially in younger children. Balance difficulties or disequilibrium can rarely be associated with OME, and older children may complain of mild discomfort or a sense of fullness in the ear.

Clearing the External Auditory Canel

Tympanic Membrane Finding

Diagnosis

A diagnosis of AOM should be made in children who present with: Moderate to severe bulging of the TM or new-onset otorrhea not caused by otitis externa

Mild bulging of the TM and recent (<48 hours) onset of ear pain or intense TM erythema

A diagnosis of AOM should not be made in children without MEE. AOM and OME may evolve into the other without any clearly differentiating physical findings; any schema for distinguishing between them is to some extent arbitrary. In an era of increasing bacterial resistance, distinguishing between AOM and OME is important in determining treatment, because OME in the absence of acute infection does not require antimicrobial therapy. Purulent otorrhea of recent onset is indicative of AOM. Difficulty in distinguishing clinically between AOM and OME is limited to circumstances in which purulent otorrhea is not present. Both AOM without otorrhea and OME are accompanied by physical signs of MEE, namely, the presence of at least two of three TM abnormalities: white, yellow, amber, or (rarely) blue discoloration; opacification other than that caused by scarring; and decreased or absent mobility. Alternatively, in OME, either air-fluid levels or air bubbles outlined by small amounts of fluid may be visible behind the TM, a condition often indicative of impending resolution .

Diagnosis

To support a diagnosis of AOM instead of OME in a child with MEE, distinct fullness or bulging of the TM may be present, with or without accompanying erythema, or, at a minimum, MEE should be accompanied by ear pain that appears clinically important. Unless intense, erythema alone is insufficient because erythema, without other abnormalities, may result from crying or vascular flushing. In AOM, the malleus may be obscured, and the TM may resemble a bagel without a hole but with a central depression. Rarely, the TM may be obscured by surface bullae or may have a cobblestone appearance. Bullous myringitis is a physical manifestation of AOM and not an etiologically discrete entity. Within days after onset, fullness of the membrane may diminish, even though infection may still be present.

In OME, bulging of the TM is absent or slight or the membrane may be retracted, erythema also is absent or slight but may increase with crying or with superficial trauma to the external auditory canal incurred in clearing the canal of cerumen.

Both before and after episodes of OM and also in the absence of OM, the TM may be retracted as a consequence of negative middle-ear air pressure. The presumed cause is diffusion of air from the middle-ear cavity more rapidly than it is replaced via the eustachian tube. Mild retraction is generally self-limited, although in some children it is accompanied by mild conductive hearing loss. More extreme retraction is of concern, as discussed later in the section on sequelae of OM.

PREVENTION

General measures to prevent OM that have been supported by numerous investigations include avoiding exposure to individuals with respiratory infection, appropriate vaccination strategies against pneumococci and influenzae, avoiding environmental tobacco smoke, and breast milk feeding.

IMMUNOPROPHYLAXIS AND VACCINATION STATUS



Heptavalent pneumococcal conjugate vaccine (PCV7) reduced the overall number of episodes of AOM by only 6-8% but with a 57% reduction in serotype-specific episodes. Reductions of 9-23% are seen in children with histories of frequent episodes, and a 20% reduction is seen in the number of children undergoing tympanostomy tube insertion. The 13-valent pneumococcal polysaccharide-protein conjugate vaccine (PCV13) contains the seven serotypes included in PCV7 (sero- types 4, 6B, 9V, 14, 18C, 19F, and 23F) and six additional serotypes (serotypes 1, 3, 5, 6A, 7F, and 19A). Early data indicate a significant reduction in the number of invasive pneumococcal mastoiditis cases since the introduction of PCV13. With the widespread use of PCV13, continued surveillance will be necessary to detect other emerging sero- types, which are also demonstrating increasing resistance. Although the influenza vaccine also provides a measure of protection against OM, the relatively limited time during which individuals and even communities are exposed to influenza viruses limits the vaccine's effectiveness in broadly reducing the incidence of OM. Limitation of OM disease is only a portion of the benefit realized from the vaccinations for pneumococci and influenza viruses.

TREATMENT

Management of Acute Otitis Media

AOM can be very painful. Whether or not antibiotics are used for treatment, pain should be assessed and, if present, treated. Individual episodes of AOM have traditionally been treated with antimicrobial drugs, and a sharp decline in complications from AOM during the last half-century seems, at least in part, attributable to the widespread routine use of antimicrobials. However, concerns about increasing bacterial resistance have prompted consideration for withholding antimicrobial treatment in certain, well-defined clinical situations. Although viral and bacterial pathogens have been cultured from middle-ear fluid obtained by tympanocentesis, two factors may argue in favor of prescribing antimicrobial therapy for children who have AOM. First, symptomatic improvement and resolution of infection may occur more promptly and more consistently with antimicrobial treatment than without, even though most untreated cases eventually resolve. Second, prompt and adequate antimicrobial treatment may prevent the development of suppurative complications.

TREATMENT

Given that most episodes of OM will spontaneously resolve, consensus guidelines have been published to assist clinicians who wish to consider a period of "watchful waiting" or observation before treating AOM with antibiotics . The most important aspect of these guidelines is that close follow-up of the patient must be ensured to assess for lack of spontaneous resolution or worsening of symptoms and that patients should be provided with adequate analgesic medications (acetaminophen, ibuprofen) during the period of observation. When pursuing the practice of watchful waiting in patients with AOM, the certainty of the diagnosis, the patient's age, and the severity of the disease should be considered. For patients <2 years of age, it is recommended to treat all confirmed diagnoses of AOM. In patients, <6 months of age, even presumed episodes of AOM should be treated because of the increased potential of significant morbidity from infectious complications. In children between 6 and 24 months of age who have a questionable diagnosis of OM but severe disease, defined as temperature of >39°C (102°F), significant otalgia, or toxic appearance, antibiotic therapy is also recommended. Children in this age-group with a questionable diagnosis and nonsevere disease can be observed for a period of 2-3 days with close follow-up.

TREATMENT

In children older than 2 years of age, observation might be considered in all episodes of nonsevere OM or episodes of questionable diagnosis, whereas antibiotic therapy is reserved for confirmed, severe episodes of AOM. Information from Finland suggests that the "watchful waiting" or delayed treatment approach does not worsen the recovery from AOM or increase the complication rates.

Accurate diagnosis is the most crucial aspect of the treatment of OM. In studies using stringent criteria for diagnosis of AOM, the benefit of antimicrobial treatment is enhanced. In addition, subpopulations of patients clearly receive more benefit from oral antimicrobial therapy than others. Younger children, children with otorrhea, and children with bilateral AOM have a significantly enhanced benefit from antimicrobial therapy in comparison with older children, children without otorrhea, or children with unilateral AOM.

Bacterial Resistance

Persons at greatest risk of harboring resistant bacteria are those who are younger than 2 years of age; who are in regular contact with large groups of other children, especially in daycare settings; or who recently have received antimicrobial treatment. The development of resistant bacterial strains and their rapid spread have been fostered and facilitated by selective pressure resulting from extensive use of antimicrobial drugs, the most common target of which in children is OM. Many strains of each of the pathogenic bacteria that commonly cause AOM are resistant to commonly used antimicrobial drugs.

☐ **First line Antimicrobial Treatment**

☐ **Unsatisfactory Response to First line Treatment**

☐ **Second line Treatment**

☐ **Antimicrobial prophylaxis**

☐ Myringotomy and Tympanocentesis

☐ Myringotomy and Insertion of Tympanostomy Tubes

☐ **AOM Associated Tube Otorrhea**

☐ Management of Otitis media with effusion

❑ Variables influencing otitis media with effusion management decisions

☐ **Medical Treatment**

☐ **Myringotomy and insertion of tympanostomy Tubes**

☐ **Adenoidectomy**

☐ **Complications of Acute Otitis Media**

☐ Intratemporal Complications

☐ Infectious Dermatitis

☐ Tympanic Membrane perforation

☐ Chronic Suppurative Otitis Media

❑ Mastoiditis

☐ Facial Paralysis

☐ **Cholesteatoma**

☐ **Labyrinthitis**

☐ Intracranial complications



Thanks for your attention
