Acute otitis media (suppurative) is an acute infection involving the middle ear (and mastoid) that is seen in all age groups. It is particularly prevalent in children during the winter months. Acute otitis media often follows or coincides with a viral upper respiratory infection (URI). Children with AIDS (acquired immunodeficiency syndrome) often have recurrent acute otitis media (AOM) as their initial presenting symptom.

1. Signs and symptoms consist of an acute onset with variable ear pain, pressure sensation, or hearing loss. Drainage may be present depending on the stage of infection, and the process may be unilateral or bilateral. The stages consist of:

   a. **Hyperemia**, a reddened, thickened tympanic membrane.

   b. **Exudation** with serous fluid in the middle ear space.

   c. **Suppuration** in which the fluid becomes purulent and the tympanic membrane may perforate.

   d. **Resolution** in which the fluid becomes thin and serous, finally resolving. Physical findings depend on the stage of disease in which the ear is inspected. Resolution can occur at any stage depending on the virulence of the organism, the host resistance, and antibiotic usage.

2. Bacteriology. The most prevalent organisms cultured in acute otitis media are *Streptococcus pneumonia*, nontypable *Haemophilus influenzae* and, to some extent, *Moraxella catarrhalis*. *H. influenzae* type B, group A streptococcus, *Staphylococcus aureus*, gram- negative enteric bacilli and anaerobic bacteria are far less prevalent. In infants and neonates, group B streptococcus and *Escherichia coli* assume more import.

3. Management

   a. **Antibiotics.** Amoxicillin (30-40 mg/kg/day) is the drug of choice in children under 12 years of age. It has better absorption and fewer side effects than ampicillin, and can be given 3 times/day instead of 4. Treatment should be continued for 10 days at least. In adults, amoxicillin is also the drug of choice. Penicillin-allergic patients should receive trimethoprim- sulfamethoxazole (TMP-SMZ). Up to a 10% failure rate is anticipated for the above medications due to resistant organisms. Frequent examinations are essential, and alternative drug treatment must be considered. These include amoxicillin-clavulanate and oral cefalosporins.

   b. **Myringotomy** is indicated to establish a bacteriologic diagnosis in patients not responding to conventional medication, in those immunosuppressed, in the neonate, and if complications ensure. Pain control should be obtained via medication, narcotics if necessary.

   c. **Topical antibiotics.** Drops may be indicated if there is a perforation or if drainage has produced a secondary external otitis. Decongestant preparations that include antihistamines do not shorten the course of the disease. Vasoconstriction (pseudoephedrine) may alleviate associated symptoms of pressure or the nasal congestion of an upper respiratory infection (URI).
Mastoiditis (acute coalescent). Mastoiditis is an unusual entity since the advent of antibiotics. Untreated, about 1-5% of cases of acute otitis media progress to mastoiditis. Treated, the incidence is much lower. The pathogenesis involves a blockage of the additus with granulation tissue or swollen mucosa so that free drainage of purulent material cannot occur. This complication leads to pressure in the mastoid cells with breakdown of cell partitions.

1. Signs and symptoms include continued pain, low-grade fever, malaise, and hearing loss. Drainage is inconsistently present, but when present has been noted to change from thick, mucopurulent secretions to thinner, foul-smelling secretions. Physical examination reveals a thickened, sometimes bulging tympanic membrane. There is thickening of the mastoid cortex with a somewhat doughy feel, a sagging of the posterosuperior canal wall, and later a protrusion of the ear.

2. Laboratory data include an elevated white blood count (WBC) with a left shift. X rays show breakdown of the normal cell partitions of the mastoid, best demonstrated on CT. (It should be noted that in acute otitis media with effusion, x rays will show clouding of the mastoid. This clouding should not be confused with acute mastoiditis, because it represents fluid in the mastoid cells, not cell breakdown.)

3. Management. Unless an abscess is present, the management includes a myringotomy to decompress the middle ear and provide for culture and sensitivity. Pending culture-directed specificity, an acceptable initial choice of antibiotic for intravenous usage is ceftriaxone, which covers most pathogens. If the process does not resolve, a complete (cortical, simple) mastoidectomy should be performed.

Complications of acute otitis media. With the exception of mastoiditis, complications can occur at any stage of acute otitis media. Whether or not complications occur depends on the virulence of the organism, the resistance of the host, anatomic abnormalities, and the institution of appropriate antibacterial therapy. The complications can be divided into:


2. Intracranial complications. Meningitis, epidural abscess, subdural abscess, brain abscess, and sigmoid sinus thrombosis. It should be noted that otitis media is still the most common cause of meningitis (excluding meningococcus) and is the most common cause of brain abscess.

3. Treatment consists of managing the complication and directing attention to the otitis media. A myringotomy is indicated to establish bacteriologic specificity. Facial nerve paralysis usually resolves spontaneously after adequate treatment of the otitis media. All of these complications, of course, constitute medical emergencies.

Acute necrotizing otitis media. This unusual form of otitis media occurs most frequently in children with severe systemic disease (eg, measles).

1. Signs and symptoms. In a few hours, a large perforation develops and may be associated with destruction of the ossicles. The perforation is frequently kidney shaped. The organism involved is most often beta-hemolytic streptococcus, although S. pneumoniae has been cultured.

2. Treatment consists of high doses of a semisynthetic penicillin. Secondary operative repair of the perforation must await the appropriate age in children (> 10 years).
**Eustachian tube dysfunction.** Eustachian tube dysfunction has a wide clinical spectrum from very mild to chronic otitis media, as described below.

1. **Signs and symptoms.** The mildest symptoms consist of a blocked or hollow feeling, pressure, mild otalgia, and occasional crackling or popping noises in the ear. These often accompany a URI or allergy.

2. **Diagnosis.** Otologic examination is normal except that the drum moves sluggishly or not at all during a Valsalva maneuver. Tympanometry may reveal a flattened curve or negative pressure. Audiologic examination is normal.

3. **Management.** These mild symptoms are self-limiting in most patients. Antihistamines and decongestants may help in lessening the symptoms but not their duration. If the symptoms are allergy-related, the underlying cause should be treated. Repeated Valsalva maneuvers may alleviate the symptoms.

**Hyperpatent (patulous) eustachian tube** is usually seen in patients who have undergone a rapid weight loss or suffer from disorders of muscle wasting. Estrogen has also been associated with the syndrome.

1. **Signs and symptoms** may be much the same as with eustachian tube dysfunction - a "hollow" or "stopped-up" sensation and pressure. Patients often state that they can hear their own breathing. Short periods of recumbence relieve the symptoms temporarily.

2. **Diagnosis** is made by observing the tympanic membrane while the patient occludes one nostril and breathes with the mouth closed. The drum will move with respiration.

3. **Management** consists of treating (or removing) the underlying cause (such as birth control medications). With persistent symptoms, tympanotomy tube insertion may give relief. Teflon injections near the eustachian tube orifice are now used infrequently. Rarely, however, is this disorder a persistent problem.

**Otitis media with effusion (OME).** OME describes a nonpurulent effusion in the middle ear space. The fluid varies from thin to mucoid. Mucoid fluid usually signifies a more chronic process. The fluid is secondary to obstruction of the eustachian tube. Defining the cause of the obstruction is indicated prior to initiating therapy whenever possible. The varied etiologies include inflammation (bacterial, viral, allergic), congenital malformation, polyps or tumors of the nasopharynx, hypertrophied adenoids, cleft palate, radiation, endocrine, or iatrogenic. Serous fluid is commonly seen in the resolution stage of acute otitis media. OME is the most common cause of hearing loss in children. It is less frequent in the adult and, when seen, the nasopharynx should be carefully evaluated for malignancy.

1. **Signs and symptoms.** The tympanic membrane may appear normal. Usually it is slightly retracted even in early onset. Fluid, with or without bubbles, may be seen and may be amber in color. With thicker fluid, the amber color is not prevalent, and the drum is dull. Prominence of the vessels is not infrequent, but in contrast to acute otitis media, the margins are distinct.

2. **Diagnostic tests.** Pneumatic otoscopy reveals diminished or no movement of the tympanic membrane. Tuning fork tests and audiometry usually reveal a conductive hearing loss. Conductive loss on audiometry should not exceed 30-40 dB with serous otitis media.
3. Management

a. In older children autoinflation and politzerization of the eustachian tube are possible, sometimes effecting resolution. If the fluid results from a resolving otitis media, the process is usually self-limiting, 90% in 3 months. Decongestants and antihistamines have not proved to be effective management for OME. Recognizing that a small percentage of serous effusions contain bacteria or may be associated with nasopharyngeal or eustachian tube infection, often a 6- to 8-week therapeutic trial of an antibiotic (amoxicillin or TMP-SMZ) is warranted. Pressure-equalizing (PE) tubes (ventilation tubes) are indicated in refractory cases to alleviate hearing loss and arrest development of permanent tympanic membrane and ossicle malfunction. Adenoidectomy is probably beneficial in selected instances of recurrent OME and acute otitis media.

b. For adults an underlying cause should be determined if possible. CT scans of the nasopharynx and sinuses are indicated to rule out infection or tumor. With a suggestive history, an allergy evaluation is indicated. Myringotomy with or without tube insertion may be indicated in selected instances.

**Barotrauma (aerotitis).** Barotrauma results from a change in atmospheric pressure with an occluded eustachian tube. This usually occurs during scuba diving or during descent when flying.

1. **Signs and symptoms** include pressure, pain (often severe), and hearing loss. Often, there is a concurrent URI or other cause of eustachian tube congestion. Examination reveals a dull drum with fluid behind it. The fluid may be bloody. Hemorrhagic areas in the tympanic membrane are frequent. Tuning fork tests and audiometric evaluation usually define a conductive hearing loss.

2. **Management.** The fluid can take several weeks to clear. Simple decongestants may alleviate the pressure sensation. Mild analgesia may be necessary in the acute phase. Instruction in pressure-equalizing techniques (Valsalva; gum chewing; prophylactic vasoconstrictors; both oral and nasal) is warranted to prevent further episodes. Pressure change with severe nasal congestion should be avoided.