CASE 9.1
Acute Otitis Media | Level 1

Dominic Chan and Jennifer Le

1. What is the subjective and objective evidence that supports the diagnosis of AOM?

The diagnosis of AOM is based on clinical presentation with otoscopic examination. Middle ear effusion with acute onset of symptoms—including subjective symptoms of irritability (fussiness) and ear pulling suggestive of otalgia (or ear pain), and objective findings on otoscopy and of fever—are presenting attributes of AOM. On otoscopic examination, the tympanic membrane appears erythematous, cloudy, and bulging (which signifies presence of middle ear effusion). A bulging tympanic membrane is most characteristic of acute inflammation and, therefore, AOM. In contrast to AOM, otitis media with effusion (OME) is characterized by fluid in the middle ear without any signs or symptoms of infection and does not necessitate the use of antibiotic therapy.

2. What are the risk factors associated with AOM that are present in this patient?

Infants and young children are at increased risk for developing AOM because of the decreased angle of the opening of the eustachian tube that allows nasopharyngeal bacteria to ascend to the middle ear cavity and prevents adequate drainage of middle ear fluid. This anatomic feature of the eustachian tubes, along with other risk factors, is associated with the development of otitis media. Other risk factors for AOM evident in this patient:

- young age of less than 2 years
- recent upper respiratory tract infections (particularly caused by rhinovirus and adenovirus) promote bacteria replication and increase inflammation in the nasopharynx and eustachian tube, which subsequently facilitates bacterial entry into the middle ear space
- exposure to second-hand tobacco smoke
- pacifier use
- bottle-feeding
- daycare attendance

If modifiable, exposure to these risk factors should be minimized.

3. Identify and resolve the medication-related problem.

The ibuprofen dose is low for this patient ~2.4 mg/kg per dose (common dose 5 to 10 mg/kg every 6 to 8 hours). This low dose may have contributed to the parent's claim of "slight" improvement with ibuprofen use at home. An alternative antipyretic medication should be considered (see next question).

The child may be experiencing increased bowel movements from ibuprofen use, although this can also be seen temporally with AOM. Discontinuation of ibuprofen and a change of therapy to acetaminophen 15 mg/kg (143 mg or 4.47 mL or round up to 4.5 mL) every 6 hours as needed for pain (maximum 75 mg/kg/day = 715 mg) may be warranted to help resolve the diarrhea. Notably, many liquid analgesics contain sorbitol as a sweetening agent, which may contribute to the undesirable effect of osmotic diarrhea (i.e., pulling water into the intestines). An over-the-counter antidiarrheal agent (e.g., loperamide) is *not* recommended for infants less than 1 year of age. For infants with diarrhea, maintaining adequate hydration with appropriate fluids (such as electrolyte-containing drinks but *not* juice or soda) and feeding are important. In addition, monitoring for a decrease in daily bowel movements to ensure resolution of this symptom and prevent complications is important.

4. Explain why this patient qualifies for initial observation or immediate pharmacologic treatment. If pharmacologic treatment is warranted, devise a plan for managing AOM.

Guidelines from 2004 recommended initial observation (i.e., without antibiotic therapy) in mild cases of AOM. Guidelines published in 2013 now recommend prescription of antibiotics *or* observation with close follow-up based on joint decision-making with the parent/caregiver for mild cases of AOM. If observation is selected, a mechanism must be in place to ensure follow-up and initiation of antibiotics if the child fails to improve within 48 to 72 hours. Antibiotic treatment should be initiated immediately in children with severe disease (i.e., toxic appearing, bulging tympanic membrane with apparent pus, persistent otalgia for greater than 48 hours, or temperature of 39°C or greater), or bilateral AOM. Specifically in this case, the patient is experiencing severe AOM evidenced by bulging tympanic membrane with pus, fever, and bilateral disease. Even if those symptoms were attenuated, the presence of bilateral AOM in a child younger than 2 years warrants treatment given the possible sequelae of untreated disease such as hearing loss and mastoiditis in a developing infant.

Antibiotic therapy is generally empiric and usually involves the use of oral agents with activity for the three most common organisms: *S. pneumoniae*, nontypeable *H. influenzae*, and *M. catarrhalis*. The patient has not been exposed to amoxicillin in the past 30 days, does not have purulent conjunctivitis, and does not have a penicillin allergy. As such, oral high-dose amoxicillin 80 to 90 mg/kg/day administered twice daily (i.e., 400 mg oral suspension twice daily, which can be provided as a suspension of 400 mg/5 mL) is the first-line treatment. Compared with twice-daily dosing, thrice-daily dosing of high-dose amoxicillin is associated with a significantly higher incidence of diarrhea. The standard duration of antibiotic therapy is 10 days (except if ceftriaxone or azithromycin is prescribed), particularly for children less than 2 years of age or those with severe disease. Clinical improvement, including fever and irritability, should occur within 48 to 72 hours after starting treatment (although symptoms may worsen during the initial 24 hours). If improvement is not evident within 48 to 72 hours, an evaluation for viral disease or a change in antibiotic therapy may be warranted.

Adjunctive therapy should address fever and otalgia. Acetaminophen, dosed as mentioned above, is effective for mild-to-moderate pain. Ibuprofen 5 to 10 mg/kg every 6 to 8 hours is *not* indicated in this patient due to the medication-related problem. Both acetaminophen and ibuprofen also serve as antipyretics. Pain should resolve within 48 to 72 hours of initiating treatment.

The two vaccines that have shown effectiveness in preventing AOM are the pneumococcal and influenza vaccines. The influenza