Acutely otitis media (AOM) in the neonate may occur more frequently than previously assumed. From 2006 to 2010, our highly experienced, general pediatric outpatient rural practice has observed a cumulative AOM rate of 1% and 2% in “neonates” from 2 to 5 weeks and 2 to 8 weeks old, respectively. However, AOM at this age is very difficult to diagnose and perplexing to manage.

In fact, the current 2004 and probably the new 2012 AAP/AAFP guidelines on AOM have avoided the issue altogether. To further compound the problem, many practitioners still rely on outdated middle ear microbiology data obtained between 1970 and 1989 that suggests Gram-negative bacilli are quite common in neonatal (under 60 days of life) AOM.

WHAT’S THE CONSCIENTIOUS PRACTITIONER TO DO?

For 30 years, our group has been involved with middle-ear diagnosis of AOM; performing tympanocentesis for routine care of severely symptomatic AOM; and conducting various antibiotic research clinical trials in children with AOM. So let me present my point of view on the significant but sorely overlooked problem of AOM in neonates 14 to 60 days old, acknowledging that AOM is extremely rare in neonates younger than 14 days old in outpatient settings.

CATEGORIES OF NEONATAL AOM

Neonatal AOM can be stratified into two categories: 1) AOM in the febrile (>100.5°F) or ill-appearing neonate; and 2) AOM in the afebrile neonate with an upper respiratory infection (URI) or minimal symptoms such as mild fussiness or decreased appetite. The first category, although uncommon, is managed the same way as in febrile neonates, who are typically stratified into two stages: 0 to 30 days and 31 to 60 days of life. Most will agree that the febrile infant 0 to 30 days old probably needs hospitalization and a complete septic workup. Among the 2% of neonates (14 to 60 days old) we observed with AOM, few were hospitalized for fever or ill appearance.

Figure 1. Infant acute otitis media: bulging, injected, pus filled.

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Dr. Block has disclosed no relevant financial relationships.

doi: 10.3928/00904481-201200524-04
As for the second category, I agree with the comprehensive *Textbook of Pediatric Infectious Disease*, which states that an otherwise healthy neonate with AOM and a minimal illness or a seemingly incidental AOM does not warrant blood cultures, complete blood count (CBC), hospitalization, or full sepsis evaluation.\(^4\) With the virtually complete elimination of *Hemophilus* type B invasive disease and the routine use of pneumococcal conjugate vaccine (PCV7/PCV13), AOM remains a truly compartmentalized and nonsystemic infection when treated with appropriate antibiotics. Granted, AOM may on rare occasions spread contiguously into mastoiditis, just as in an older child with AOM, regardless of previous oral antibiotic use.

**MICROBIOLOGY OF AOM**

Most data currently available on AOM were obtained from neonates who were hospitalized or from those presenting or referred to the emergency department (ED) with fever and/or irritability.\(^2,5\) These data from Israel, however, provide us with substantial numbers and a clearer picture about the middle ear pathogens recovered in the last decade. Unfortunately, we still have virtually no recent data regarding AOM pathogens in otherwise healthy outpatient neonates during the PCV7/PCV13 era.

Berkun et al\(^2\) reported the middle-ear microbiology from 277 neonates (1 to 60 days old) diagnosed with AOM who were hospitalized with fever and/or irritability. These were not healthy children. They were all referred for a sepsis work-up; 77% presented with fever. Gram-negative bacilli were isolated in only 10.5% of the middle ears. Most of the middle-ear specimens yielded the usual AOM pathogens of *S. pneumoniae*, nontypable *H. influenzae*, and occasionally *M. catarrhalis* or *S. pyogenes*.

Turner et al\(^5\) reported the middle-ear microbiology from 137 neonates (1 to 60 days old) with AOM who presented to the ED with either fever and/or irritability. Again Gram-negative bacilli were similarly recovered in about 9% of neonates, with most AOM specimens yielding the middle-ear pathogens previously described. Furthermore, the authors emphasized, “We are not convinced that even the enteric pathogens reported here were true pathogens ... they were likely contaminants.” The authors concluded that, “AOM per se in febrile or febrile infants <2 months of age is unlikely to be a predictor of risk for serious bacterial infections [SBI].”\(^5\) No correlation was observed between any of the pathogens recovered from the SBI (eg, urinary tract infections, pneumonia, meningitis, and bacteremia) with those from AOM. Thus, they recommended outpatient management of afebrile infants younger than 2 months with AOM, without routine concern for SBI.

In our own pediatric practice, we have cultured the middle ears of about 20 neonates over 2 decades and have re-

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**Figure 2. Examples of three different curette styles for cleaning the auditory canal.**

**Figure 3. Nondisposable speculum (left) (aperture 2.5 mm) available for Welch-Allyn Macroview; disposable speculum (right) (aperture 2.2 mm) available for regular otoscope.**

**Figure 4. Two longer, shinier nondisposable specula (left and center) and a typical single disposable speculum (right). Note the difference in tapering.**
covered only the typical otopathogens described above; no Gram-negative bacilli have been isolated.

**DIAGNOSIS OF NEONATAL AOM**

I still firmly believe that one of the major reasons for misdiagnosis of AOM is the use of low-quality otoscopes and speculum, \(^6\) \(^7\) (particularly for the neonate). Berkun and colleagues\(^2\) observed that pediatricians accurately diagnosed AOM in only 45% of 277 hospitalized neonates who were subsequently diagnosed with AOM by an otolaryngology specialist. As always, the devil is in the details: we must improve our diagnostic skills.

Clinicians who wish to optimally visualize the tympanic membranes (TM) of neonates should consider using the following instruments:

- Ear curette (Figure 2, see page 226). The majority of neonates will have some waxy debris in the ear canal that will usually need to be carefully removed with some form of curette.

  The neonate’s ear canal is usually only about 2.5-mm wide. Because it is a very tiny hole to peer down, the canal will need to be fairly clean.

- Nondisposable 2.5-mm specula (Figure 3, see page 226). Using the original speculum is most helpful for visualization of the TMs of neonates. It provides the optimal comfortable size aperture (2.5 mm), tapering, and length for these tiny but long canals. Because the speculum is nondisposable, it will need to be wiped with an alcohol swab after each encounter. However, the disposable speculum provides inferior lighting as it has a narrower aperture (2.2 mm) (Figure 4, see page 226). I find it too short, too stubby, and too dull.

- Welch-Allyn Macroview otoscope (Figure 5). This top-of-the-line otoscope provides maximum brightness, using a much longer-lasting lithium-powered battery, and extra magnification over the usual hand-held otoscope. It is definitely superior; compare for yourself.

The easiest and optimal position to examine the TMs (and clean the canal) of a neonate is to place the baby completely on his side, with the parent restraining the ipsilateral arm and leg, simultaneously using the free hand to stabilize a pacifier, if there is one, in the child’s mouth. This position usually results in much less resistance from the infant; it will also allow your free hand total access to restrain and stabilize the neonate’s head.

Examining the normal TM of the neonate is like looking down a dark hole; the TM is very angulated. So when one observes a full/bulging TM, or TM appearance of yellow pus, (Figure 1, see page 225) or a heavy white/yellow discharge (not wax) in the canal, you have diagnosed AOM.\(^7\) (Otitis externa is virtually unheard of in neonates.) Assessment of mobility is daunting and not much help here either — so put away your insufflator.\(^7\)\(^8\) One really needs to concentrate on carefully examining the characteristics of that tiny 2.5-mm diameter TM.

**OUTPATIENT MANAGEMENT OF AOM**

I wholeheartedly agree with Berkun and colleagues,\(^2\) that AOM in a neonate without a fever and with a normal leukocyte count should still be treated with antibiotics. Watchful waiting is never an option here.\(^2\)

I also do not hospitalize well-appearing neonates with an upper respiratory infection who are not febrile. Adding the diagnosis of a compartmentalized infection, such as AOM, should rarely alter this approach.\(^4\) Otherwise, unnecessarily exposing an otherwise healthy infant to potential nosocomial infections is not prudent and can actually be dangerous for a newborn (think influenza, respiratory syncytial virus, rotavirus, etc.).
Exposing the infant to the traumas of a very difficult intravenous stick, urine catheterization, and lumbar puncture are acceptable when necessary, but horrific for the child and parent if unnecessary. Remember, the pathogens of AOM will rarely have any relationship to those of SBI.

Should we perform a CBC in an afebrile, non-irritable infant with AOM? It could be justifiable if one is particularly worried about the neonate for any “Gestalt” reason, or when the child is under 30 days old. If the leukocyte count is significantly elevated, or if the child is severely neutropenic, then blood culture, urine culture, and possibly a cerebrospinal fluid sample (depending on the appearance and age of the child) should be obtained. Nonetheless, the other most important assessment is your thorough clinical examination.

All antibiotic choices for neonatal (14 to 60 days old) AOM are entirely “off-label” use. I think many of us proceed with an oral antimicrobial such as amoxicillin (80 to 90 mg/kg/day). However, in light of the high rates of resistance among most middle-ear pathogens, some experts prefer amoxicillin clavulanate (ES) (80 to 90 mg/kg/d) or a broad-spectrum cephalosporin such as cefdinir (14 mg/kg/d). In my experience, amoxicillin clavulanate can cause significant diarrhea in neonates, so use it with some trepidation. A single intramuscular dose of ceftriaxone (~50 mg/kg) is acceptable for use after 7 days of life, especially for the somewhat worrisome neonate or for the family or child with possible adherence issues. Three days of a single daily injection of ceftriaxone may be another consideration; however, due to its displacement of bilirubin, one must avoid ceftriaxone use in the infant less than 30 days old with signs of hyperbilirubinemia. Also, several daily doses of parenteral ceftriaxone has been associated with gallbladder sludge and even gallbladder hydrops.

Once one diagnoses neonatal AOM, a follow-up visit or phone call to the family in the next 12 to 72 hours may be reassuring, particularly for some neonates 14 to 30 days old. Finally, I advocate rechecking the ears in 10 to 14 days because of the lack of any specific symptoms or signs to guide the parents as to whether AOM has persisted.

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