Pediatric Infectious Disease
Unusual Head and Neck Infections

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KEYWORDS

• Pediatric • Sinusitis • Acute otitis media • Pharyngitis • Lymphadenitis

KEY POINTS

- Otoscopic findings are critical in making an accurate acute diagnosis of otitis media.
- In children, 80% to 90% of orbital or postseptal cellulitis is most commonly secondary to acute or chronic sinusitis.
- The syndrome of periodic fever, aphthous stomatitis, pharyngitis, and cervical adenitis is the most common periodic fever disease in children.
- Human papillomavirus is a causative agent of oropharyngeal cancer in 45% to 90% of cases.

Infections in children in the head and neck regions are common, leading to frequent use and overuse of antibiotics. Viral upper respiratory tract infection, pharyngitis, acute otitis media, and acute sinusitis comprise the majority of pediatric visits to primary care providers. This review includes common as well as diverse and unusual infectious diseases that occur in infants, children, and adolescents. In addition, the first available pediatric vaccines with the potential to prevent oropharyngeal cancers are reviewed.

SINUS/ORBIT/MIDDLE EAR INFECTIONS

In the United States, acute otitis media (AOM) is the most common condition for which antibiotics are prescribed for children. Clinical practice guidelines suggest observation without use of antibacterial agents in select children with uncomplicated AOM. The decision to observe or treat is based on a child's age, diagnostic certainty, and illness severity.[1] A recent systematic review on AOM diagnosis and treatment found that otoscopic findings are critical in making an accurate diagnosis of AOM. AOM microbiology has changed with use of pneumococcal conjugate vaccine—heptavalent (PCV7). The prevalence of *Streptococcus pneumoniae* as the cause of AOM has decreased from 48% to 31% of isolates while that of *Haemophilus influenzae* has increased from 43% to 57% of isolates. *Moraxella catarrhalis* makes up 3% to 10% of isolates. Antibiotics are modestly more effective than no treatment, but cause adverse effects in 4% to 10% of children (rash and/or diarrhea). Most antibiotics have comparable clinical success, although data are absent regarding long-term effects on antimicrobial resistance.[2]

The treatment of AOM has become challenging with the emergence of pneumococcal resistance. Many penicillin-resistant strains of pneumococci have alterations in their penicillin-binding proteins that render them resistant to other β-lactam agents, such as ceftriaxone and cefotaxime. Nonsusceptible strains are further divided into intermediate and resistant isolates. This resistance can be overcome by using higher dosages of penicillin. Because antibiotic concentrations in nonmeningeal sites, such as the sinus and middle ear, are significantly greater than achievable concentrations in the meninges, definitions of susceptibility differ depending on whether the infection is in a meningeal or nonmeningeal site. For example, an isolate of *S pneumoniae* that has a minimal inhibitory concentration (MIC) of 2.0 μg/mL isolated from the middle ear is considered intermediately resistant to ceftriaxone. The same isolate

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found in the cerebrospinal fluid is considered resistant to ceftriaxone. These definitions take into account the antibiotic concentrations that can be achieved at different sites in order for the antimicrobial levels to be above the MIC for the treatment period. The use of high-dose oral amoxicillin (90 mg/kg/d) is commonly used as first-line therapy for treatment of AOM.[3,4]

Whereas *Mycoplasma pneumoniae* is a well-documented cause of atypical pneumonia as well as other respiratory syndromes such as bronchitis, bronchiolitis, pharyngitis, and croup,[5] it is an unlikely causative agent in bullous myringitis. A study of 49 middle-ear fluid samples from children with bullous and hemorrhagic myringitis were studied by polymerase chain reaction (PCR) for *M pneumoniae*; all samples were negative, suggesting that *M pneumoniae* is not an etiologic agent in acute bullous myringitis.[6]

Studies in children have shown that bullous myringitis accounts for less than 10% of AOM cases, and that the distribution of viral and bacterial pathogens in bullous myringitis is similar to that in AOM without bullous myringitis, except for a relative increase in the proportion of *S pneumoniae*.[5] In a study of 518 cases of AOM in children aged 6 months to 12 years, 41 cases (7.9%) were complicated by bullous myringitis. Children with bullous myringitis had more severe symptoms at the time of diagnosis and were more likely to have bulging of the tympanic membrane in the quadrants that were not obscured by the bulla. These children also required more aggressive pain management. Although parents and clinicians may agree that a watchful-waiting approach is appropriate for older children with mild AOM and may be acceptable, children experiencing painful AOM with bullous myringitis may not be successful candidates for a watchful-waiting approach.[7]

Treating a child with a draining ear is a common occurrence, and a multitude of factors must be considered in arriving at a diagnosis, including a history of the frequency, duration, and characteristics of the drainage. Cleansing of the external auditory canal is vital before the tympanic membrane can be accurately visualized for accurate diagnosis and treatment. The differential diagnoses of a draining ear include acute suppurative otitis media, otitis externa, granuloma, bullous myringitis, and a retained foreign body; most patients will respond well to a regimen of aural hygiene and topical therapy. Young children and those with a chronically draining ear may require more aggressive therapy, with systemic antimicrobials and culture; examination under anesthesia may be necessary to properly debride and visualize the canal. Children with tympanostomy tubes are especially at high risk for suppurative complications, and may require removal of the tube if drainage persists.[8]

Like AOM, *S pneumoniae*, *H influenzae*, and *M catarrhalis* are the most common bacterial pathogens causing uncomplicated acute sinusitis. Complications from sinusitis include preseptal or periorbital cellulitis, orbital cellulitis, epidural abscess, and venous sinus thrombosis. Intracranial complications of sinusitis such as epidural or subdural empyema are most commonly caused by microaerophilic or anaerobic streptococci, and such infections are often polymicrobial. Streptococci recovered on culture are commonly from the *Streptococcus anginosus* group (also known as *milleri* streptococci). *S aureus* can cause subdural or epidural empyema, but is more commonly isolated in combination with other pathogens such as streptococci.

Swelling of or around the eye may be due to infectious and noninfectious causes. Noninfectious causes of eye swelling include: (1) blunt trauma for which the history provides the key to the diagnosis—in these cases, bruising and eyelid swelling increase over 48 hours and then resolve over a several-day period; (2) allergic inflammation, which includes contact hypersensitivity or angioneurotic edema; (3) local edema whereby there is bilateral, boggy, nontender, nondiscolored soft-tissue swelling that may be caused by hypoproteinemia or congestive heart failure; and (4) tumors of the eye such as hemangiomas of the lid, ocular tumors (retinoblastoma, choroidal melanoma), and orbital neoplasms (neuroblastoma, rhabdomyosarcoma). These conditions usually cause a gradual onset of proptosis in the absence of inflammation.

Infectious causes of eye swelling may be periorbital or orbital. Cellulitis is defined as an infection that is either anterior to the orbital septum (preseptal or periorbital), or as an infection that is posterior to the orbital septum (orbital or postseptal). The orbital septum is a thin connective tissue extension of the orbital periosteum that is reflected into the upper and lower tarsal plates of the eyelids. It serves as a barrier between the superficial lids and the orbit.[9,10]

The eye and the paranasal sinuses are closely contiguous structures that share common elements. The venous system that drains the orbit, the ethmoid and maxillary sinuses, and the skin of the eye and periorbital tissue provide opportunities for spread of infection from one anatomic site to another and predisposes to involvement of the cavernous sinus. These veins represent an anastomosing and valveless network. The orbit is surrounded by the frontal sinus (roof of the orbit)