

Evaluation And Treatment Of Common Ear Complaints In The Emergency Department

You are moonlighting in a small community ED with no in-house support. The EMS team arrives with your next patient who has been in a bar fight. He is intoxicated and bleeding through the gauze wrapped around his head. When you remove the gauze to examine the wound to his ear, you find that he has sustained a 5-cm laceration through the pinna. You wish you were back in the city where you could call facial plastics to repair this, but here in this ED you are on your own. How will you approach this repair?

Meanwhile, as your tech is setting up for the ear repair, you return to the wailing 2-year-old in the room next door and diagnose an acute otitis media. The mother asks which antibiotic you will be prescribing. The child appears well, has only a low-grade fever, and is otherwise healthy. You wonder whether you need to give antibiotics at this point. What factors need to be considered in making that decision?

Finally, a middle-aged gentleman presents with unilateral hearing loss that has developed over the preceding 24 hours. When your examination fails to reveal cerumen impaction, you wonder what to do next and whether any steps should be taken tonight...

Ear complaints frequently bring patients to adult and pediatric emergency departments (EDs). Although rarely life-threatening, these disorders have a significant impact on the patient's daily life. The emergency clinician needs to be able to distinguish complaints that need immediate evaluation and treatment in the ED from those that are best handled by the primary care clinician

Editor-in-Chief

Andy Jagoda, MD, FACEP
Professor and Chair, Department of Emergency Medicine, Mount Sinai School of Medicine; Medical Director, Mount Sinai Hospital, New York, NY

Editorial Board

William J. Brady, MD
Professor of Emergency Medicine and Internal Medicine, Vice Chair of Emergency Medicine, University of Virginia School of Medicine, Charlottesville, VA

Peter DeBlieux, MD
Professor of Clinical Medicine, LSU Health Science Center; Director of Emergency Medicine Services, University Hospital, New Orleans, LA

Wyatt W. Decker, MD
Professor of Emergency Medicine, Mayo Clinic College of Medicine, Rochester, MN

Francis M. Fesmire, MD, FACEP
Director, Heart-Stroke Center, Erlanger Medical Center; Assistant Professor, UT College of Medicine, Chattanooga, TN

Nicholas Genes, MD, PhD
Instructor, Department of Emergency Medicine, Mount Sinai School of Medicine, New York, NY

Michael A. Gibbs, MD, FACEP
Chief, Department of Emergency Medicine, Maine Medical Center, Portland, ME

Steven A. Godwin, MD, FACEP
Associate Professor, Associate Chair and Chief of Service, Department of Emergency Medicine, Assistant Dean, Simulation Education, University of Florida COM-Jacksonville, Jacksonville, FL

Gregory L. Henry, MD, FACEP
CEO, Medical Practice Risk Assessment, Inc.; Clinical Professor of Emergency Medicine, University of Michigan, Ann Arbor, MI

John M. Howell, MD, FACEP
Clinical Professor of Emergency Medicine, George Washington University, Washington, DC; Director of Academic Affairs, Best Practices, Inc, Inova Fairfax Hospital, Falls Church, VA

Keith A. Marill, MD
Assistant Professor, Department of Emergency Medicine, Massachusetts

General Hospital, Harvard Medical School, Boston, MA

Charles V. Pollack, Jr., MA, MD, FACEP
Chairman, Department of Emergency Medicine, Pennsylvania Hospital, University of Pennsylvania Health System, Philadelphia, PA

Michael S. Radeos, MD, MPH
Assistant Professor of Emergency Medicine, Weill Medical College of Cornell University; Department of Emergency Medicine, New York Hospital Queens, Flushing, NY

Robert L. Rogers, MD, FACEP, FAAEM, FACP
Assistant Professor of Emergency Medicine, The University of Maryland School of Medicine, Baltimore, MD

Alfred Sacchetti, MD, FACEP
Assistant Clinical Professor, Department of Emergency Medicine, Thomas Jefferson University, Philadelphia, PA

Scott Silvers, MD, FACEP
Chair, Department of Emergency Medicine, Mayo Clinic, Jacksonville, FL

Corey M. Slovis, MD, FACP, FACEP
Professor and Chair, Department of Emergency Medicine, Vanderbilt University Medical Center; Medical Director, Nashville Fire Department and International Airport, Nashville, TN

Jenny Walker, MD, MPH, MSW
Assistant Professor; Division Chief, Family Medicine, Department of Community and Preventive Medicine, Mount Sinai Medical Center, New York, NY

Ron M. Walls, MD
Professor and Chair, Department of Emergency Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA

Scott Weingart, MD, FACEP
Assistant Professor of Emergency Medicine, Mount Sinai School of Medicine; Director of Emergency Critical Care, Elmhurst Hospital Center, New York, NY

Senior Research Editor

Joseph D. Toscano, MD
Emergency Physician, Department of Emergency Medicine, San Ramon Regional Medical Center, San Ramon, CA

Research Editor

Lisa Jacobson, MD
Chief Resident, Mount Sinai School of Medicine, Emergency Medicine Residency, New York, NY

International Editors

Peter Cameron, MD
Chair, Emergency Medicine, Monash University; Alfred Hospital, Melbourne, Australia

Giorgio Carbone, MD
Chief, Department of Emergency Medicine Ospedale Gradenigo, Torino, Italy

Amin Antoine Kazzi, MD, FAAEM
Associate Professor and Vice Chair, Department of Emergency Medicine, University of California, Irvine; American University, Beirut, Lebanon

Hugo Peralta, MD
Chair of Emergency Services, Hospital Italiano, Buenos Aires, Argentina

Maarten Simons, MD, PhD
Emergency Medicine Residency Director, OLVG Hospital, Amsterdam, The Netherlands

July 2010
Volume 12, Number 7

Authors

Jeffrey Siegelman, MD

Emergency Medicine Physician, Harvard Affiliated Emergency Medicine Residency Program, Brigham and Women's Hospital, Boston, MA

George Kazda, MD

Director, ENT Emergency Department, Massachusetts Eye and Ear Infirmary, Boston, MA

Daniel Lindberg, MD

Attending Physician, Emergency Department, Brigham and Women's Hospital and Children's Hospital, Boston, MA

Peer Reviewers

Michael Bessette, MD, FACEP

Chairman of Emergency Medicine, Jersey City Medical Center, Jersey City, NJ

Sigrid Hahn, MD, MPH

Assistant Professor, Department of Emergency Medicine, Mount Sinai School of Medicine, New York, NY

CME Objectives

Upon completion of this article, you should be able to:

1. Understand the diagnosis of common emergencies involving the ear.
2. Be able to develop a differential diagnosis for ear complaints.
3. Formulate an evaluation plan of ear complaints that is efficient, parsimonious, and thorough.
4. Develop evidence-based treatment strategies for complaints of the ear.

Date of original release: July 1, 2010

Date of most recent review: April 15, 2010

Termination date: July 1, 2013

Method of participation: Print or online answer form and evaluation

Prior to beginning this activity, see "Physician CME Information" on page 20.

or in an otolaryngologist's office. This review will cover 4 common complaints involving the ear: pain (otalgia), hearing loss, tinnitus, and trauma.

Critical Appraisal Of The Literature

An Ovid MEDLINE® (www.ovid.com) search of the literature on emergencies of the ear was undertaken, using the following search terms: *acute otitis media, otitis media with effusion, otitis externa, otalgia, hearing loss, tinnitus, foreign body, herpes zoster, and trauma* in conjunction with the terms *ear, diagnosis, treatment, epidemiology, microbiology, acute, and emergent*. The search was limited to literature in English that reported on clinical trials, randomized controlled trials (RCTs), practice guidelines, meta-analyses, and review articles published within the last 10 years. Other sources queried included the Cochrane Library and the National Guideline Clearinghouse (www.guidelines.gov). The search initially yielded 335 articles, the titles and abstracts of which were reviewed for relevance, and was then extended to include the relevant references cited in articles identified. Analysis of data was weighted according to the strength of each study, with greater emphasis placed on well-conducted RCTs and on professional society guidelines, and less value placed on case reports and retrospective studies. Evidence on which to base recommendations varied by topic; it was particularly rich in the

Table Of Contents

Critical Appraisal Of The Literature	2
Epidemiology	2
Anatomy Of The Ear.....	3
Etiology.....	3
Prehospital Care	5
Emergency Department Evaluation.....	5
Diagnostic Studies.....	7
Treatment.....	8
Clinical Pathway For Treatment Of Acute Otitis Media	10
Special Circumstances	16
Controversies/Cutting Edge.....	16
Summary	16
Case Conclusions	17
References.....	17
CME Questions.....	19
Evidence-Based Practice Recommendations for this issue.....	www.ebmedicine.net/pr7

Available Online At No Charge To Subscribers

EM Practice Guidelines Update: Summary of Guidelines For Diagnosis And Management Of Thoracic Aortic Disease In The Emergency Department, www.ebmedicine.net/thoracic

area of otitis media (OM) and less strong on the topics of tinnitus and sudden hearing loss. Three sets of guidelines related to topics relevant to emergency practice that were published by major medical societies and several other guidelines from individual hospital systems were identified. (See **Table 1.**) None of these guidelines were written by an emergency medicine society. All were evidence-based reviews of the current literature and were guided by preset criteria for levels of evidence. Each delivered recommendations on a scale ranging from "strong recommendation" to "recommendation" to "option" to "no recommendation" and did so using an evidence grading scale from A (multiple RCTs) to D (case reports, expert opinion). For a review and comment on the 2006 guideline on otitis externa from the American Academy of Otolaryngology-Head and Neck Surgery Foundation (AAO-HNSF), see *EM Practice Guidelines Update* November 2009 issue, which is available online at www.ebmedicine.net/EMPGU.

Epidemiology

Ear pain (otalgia) is a common presenting complaint in the ED, accounting for nearly 1 million visits in 2006 by children under age 15.¹ In children (the vast majority of cases in which ear pain is the chief complaint), the most common diagnosis will be acute otitis media (AOM). In a small case series involving Israeli children, AOM was found to be an occasional cause of fever of unknown origin.² In adults, otalgia is less common, with an annual incidence of far less than 1%.³ Nevertheless, the potential for complications in adults with undiagnosed ear disease is enough to warrant examination of the ears in all patients who present with otalgia, as well as in comatose or demented elderly patients with fever of unknown source.

Otitis externa (OE), also commonly referred to as "swimmer's ear," is an infection of the external auditory canal. It is defined by the AAO-HNS as generalized inflammation of the external ear canal with

Table 1. Recent Practice Guidelines Regarding Ear Complaints

Professional society	Title
AAP, AAFP	Diagnosis and Management of Acute Otitis Media; May 2004 ¹²
AAO-HNSF	Clinical Practice Guideline: Otitis Media With Effusion; May 2004 ²⁴
AAO-HNSF	Clinical Practice Guideline: Acute Otitis Externa; April 2006 ⁴

Abbreviations: AAFP, American Academy of Family Physicians; AAO-HNSF, American Academy of Otolaryngology-Head and Neck Surgery Foundation; AAP, American Academy of Pediatrics.

or without involvement of the pinna or tympanic membrane. Otitis externa is more common in persons living in warmer climates with higher humidity and in those with increased exposure to swimming pools.⁴ The actual incidence of OE in children and adults has not been determined.

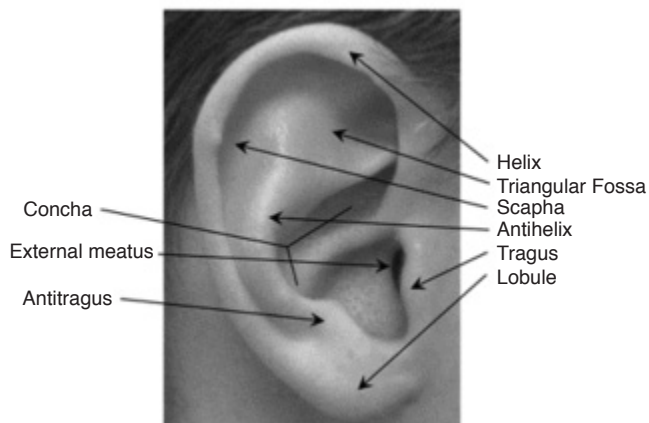
Although data on the incidence of tinnitus and of hearing loss as chief complaints in the ED are also lacking, in the authors' experience these are uncommon presenting symptoms. Tinnitus is the perception of sound (such as ringing) in the ears or head not attributable to any external noise.⁵ Adults between the ages of 40 and 70 are most likely to report symptoms, although all ages can be affected, including children.⁶

Anatomy Of The Ear

A review of the anatomy of the ear is crucial in understanding and accurately describing the findings on examination. (See Figures 1 and 2.) The external ear, also known as the pinna or auricle, is composed of an outer rim (the helix) and an inner rim (the antihelix). The helix terminates in a crus just superior to the external auditory meatus and the antihelix terminates in superior and anterior crura, which form the boundaries of the triangular fossa along with the helix. The scapha is the furrow between the helix and antihelix, and the concha is the depression surrounded by the antihelix. It is crucial to remember that the cartilage of the ear, like all cartilage, is avascular and derives its nutrition from the surrounding perichondrium. If separated from this supply (eg, by trauma or auricular hematoma), the cartilage is at risk for infection, erosive chondritis, and necrosis.⁷

Inspection of the middle ear will first reveal the skin-lined external auditory canal coursing from the

Figure 1. Anatomy Of The External Ear



Reprinted with permission from Jeffrey Siegelman, MD.

external auditory meatus to the tympanic membrane (TM). The malleus is adherent to the TM, and its umbo (knob) can often be seen in the center of the TM, with a light reflex emanating anteroinferiorly. The malleus is the first in a series of 3 small ear bones (ossicles) that connect the TM to the oval window of the inner ear via the incus and stapes. The incus may be visualized superiorly. The function of the TM is to convert air-conducted sound waves into bone conduction via the ossicles. Next, the oval window begins the process of converting sound from bone conduction to neural conduction. This process is the basis of the hearing tests described on page 7.

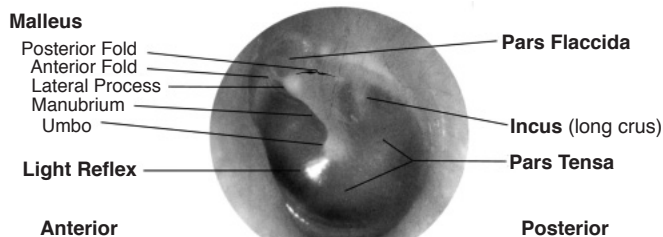
The eustachian tube connects the middle ear with the nasopharynx and serves as a pressure equalizer. Normally it is closed, but it opens during swallowing and yawning. In children, this tube is shorter and more steeply angled than in adults. Because the nasopharyngeal bacterial flora may more easily enter the middle ear in children, they have a higher incidence of OM. The eustachian tube is similarly implicated in the relationship between OM and upper respiratory infections, since nasopharyngeal swelling leads to congestion of the tube, increased negative middle ear pressure, and an accumulation of pathogens.⁸

Etiology

Otalgia

Complaints of ear pain can reflect a variety of disorders. Infections of the external or middle ear are frequent causes of pain, as are trauma to the ear and foreign bodies lodged within it. Because the ear is innervated by sensory afferents from cranial nerves V, VII, IX, and X, and the cervical plexus, a variety of head and neck diseases can manifest as referred pain to the ear. Among many others, these diseases include temporomandibular dysfunction, dental disease, parotitis, pharyngitis, tonsillitis, and head and neck cancer. In one study of 500 patients with ear pain in non-ED settings, 28% of the cases were due to secondary, or referred, otalgia.⁹ A full discussion

Figure 2. Normal Left Tympanic Membrane As Viewed Through An Otoscope



Reprinted with permission from eMedicine.com, 2008. Available at: <http://emedicine.medscape.com/article/859316-overview>.

of these entities is beyond the scope of this article, but a careful and thorough physical examination should be conducted to find these more surreptitious causes in the patient who presents with ear pain but whose ear examination is normal.

Acute Otitis Media

According to a systematic review of the literature published in 1994, bacterial pathogens that commonly cause AOM include *Streptococcus pneumoniae*, *Moraxella catarrhalis*, and *Haemophilus influenzae*.¹⁰ No similar studies were identified subsequent to the widespread use of the *H influenzae* type B vaccine. Some data suggest that antibiotic sensitivities may be changing as routine vaccination schedules change. One well-conducted prospective study of antimicrobial sensitivities reported that *S pneumoniae* isolates were becoming increasingly sensitive to penicillin as vaccination against infections with *S pneumoniae* became more prevalent.¹¹ Numerous viruses also are known to cause AOM and are present in respiratory secretions in up to 75% of cases.¹²

Otitis Externa

The cause of OE is multifactorial and is often related to excessive cleaning of the ears and removal of the cerumen that normally acidifies the canal and provides a barrier to infection. Similarly, excessive or prolonged exposure of the ears to water, the use of hearing aid molds, and the excessive use of earbud headphones have been associated with OE.

Common bacterial causes of OE include infections with *Staphylococcus aureus* and *Pseudomonas aeruginosa*, the latter organism being involved in the preponderance of cases of malignant OE. Fungal organisms are also involved in up to 10% of cases¹³; *Candida* and *Aspergillus* were found to be the most commonly cultured organisms in one retrospective study of ear cultures performed on 166 patients with OE.¹⁴ Otomycosis is more prevalent in tropical and subtropical climates, but it can also occur after prolonged water exposure or occasionally following application of topical antibiotics for persistent bacterial OE.¹⁵

Malignant OE is an unusual and aggressive form of the disease that generally occurs in elderly, diabetic, or immunocompromised patients. It presents with excruciating pain and granulation tissue in the ear canal. If left untreated, it can spread to become skull-base osteomyelitis, meningitis, or encephalitis, with facial nerve paralysis as an early sign.

Hearing Loss

A common cause of sudden atraumatic hearing loss that brings a patient to the ED is mechanical obstruction such as cerumen or foreign body impaction. When these possibilities have been excluded, one must consider the diagnosis of sudden sensorineural hearing loss (SSHL). (See Table 2.) Several

theories have been proposed to explain idiopathic SSHL. Although each seems to offer some level of plausibility and insight, none accounts for all cases. A viral etiology is often proposed, based on the association between certain congenital viral infections and deafness. Sudden sensorineural hearing loss has been compared to the sudden presentation of facial palsy due to viral infection of the facial nerve. Vascular disruption has also been proposed, since ischemic events affecting the auditory pathway have been described. Sudden deafness has been reported in patients with vertebrobasilar ischemia, but it is uncommon and rarely, if ever, presents without other neurologic symptoms. One review of a registry of 685 patients with vertebrobasilar ischemia found sudden deafness in 6%, and all had vertigo or other neurologic symptoms.^{16,17} Rupture of the intracochlear membrane has been suggested as a third possible cause. Finally, an autoimmune process is possible; sensorineural hearing loss is known to be associated with autoimmune diseases such as Wegener's granulomatosis.¹⁸

Tinnitus

The mechanism underlying tinnitus is not well-understood. Hypothesized etiologies include damage to cochlear hair cells that causes them to discharge repeatedly, hyperactive auditory nerve fibers or brainstem nuclei, and a decrease in the usual sup-

Table 2. Differential Diagnosis Of Sudden Hearing Loss

Conductive (most common)

- Cerumen impaction
- Foreign body
- Otitis media with effusion
- Acute otitis media
- Otitis externa

Trauma

- Temporal bone fracture
- Shearing of cranial nerve VIII
- Ossicle dislocation
- Barotrauma/blast injury
- Tympanic membrane perforation

Inflammatory

- Sarcoidosis
- Wegener granulomatosis

Vascular

- Stroke
- Radiation vasculitis

Idiopathic

Adapted from Krishnan A, et al. CT arteriography and venography in pulsatile tinnitus: preliminary results. *AJNR*. 2006;27(8):1635-1638.

pressive effect of the auditory cortex on tonic neuronal activity. Patients most commonly report tinnitus in the setting of noise-induced hearing loss or in presbycusis, the gradual decrease in the ability to hear high-pitched sounds, which is associated with aging.⁶ Not surprisingly, tinnitus has been noted in veterans of recent military activity in Iraq after TM perforation from close-range blasts.¹⁹ For the emergency clinician, the most important causes are aspirin overdose and those conditions in which turbulent blood flow causes pulsatile tinnitus. In up to 40% of cases with pulsatile tinnitus, computed tomography (CT) identified the etiology, which includes carotid artery dissection and arteriovenous malformation.²⁰ The differential diagnosis of tinnitus can be divided into subjective and objective types. (See Table 3.) The former is experienced by the patient but cannot be heard by the examiner, whereas the latter can be heard by both.

Prehospital Care

Most complaints isolated to the ear will not require emergent transportation to the hospital, although EMS personnel may encounter trauma victims with injuries to the ear or patients with vertigo whose symptoms are too severe to allow them to transport themselves. The literature offers no specific recommendations for how to handle auricle amputations; therefore, the standard procedures that apply to any amputation should be followed, with control of bleeding at the proximal site and transport of the severed part wrapped in sterile gauze and placed indirectly on an ice-water bath. Although there are

no specific considerations in the literature regarding aeromedical transport for emergencies of the ear, this option might be considered in the event of an amputation when the ED is remote from a center with reconstructive surgery capabilities. When encountering a patient in the field whose injury is not apparent, the ear may provide important historical clues to the cause. For example, hearing loss in the setting of a blast injury could indicate TM perforation, while tinnitus in a hypotensive patient could be a manifestation of severe anemia.

ED Evaluation

The vast majority of urgent diagnoses of external ear or middle ear complaints can be reliably made based on the history and physical examination alone. Unlike many other common ED complaints, emergent imaging and more sophisticated testing are rarely warranted, with a few exceptions noted below. The history and physical examination should focus on both the ear itself and other structures that could be the cause of referred pain or other symptoms to the ear.

History

The history will be guided by the complaint. For patients who present with otalgia, as with other complaints of pain, a description of time of symptom onset, quality, radiation, severity, and modifying factors will be helpful. For instance, in distinguishing AOM from otitis media with effusion (OME), the time of onset will be a deciding factor, with pain beginning suddenly and early in AOM and late (if at all) in OME.¹² Associated symptoms,

Table 3. Causes Of Tinnitus

Type	Cause(s)	Characteristics
Subjective tinnitus		
Otologic	Noise-induced hearing loss, presbycusis, otosclerosis, otitis, impacted cerumen, Ménière disease	Variably described as ringing, buzzing, cricket-like, hissing, whistling, and humming. Most often high-pitched
Neurologic	Head injury, MS, whiplash, vestibular schwannoma	
Infectious	AOM, sequelae of Lyme disease, meningitis, neurosyphilis	
Drug-related	Aspirin, NSAIDs, aminoglycosides, loop diuretics, chemotherapy (eg, platinum and vincristine)	
Other	TMJ dysfunction	
Objective tinnitus		
Pulsatile	Carotid artery stenosis, anemia, AVM, vascular tumors, carotid dissection, atherosclerosis, valvular heart disease (aortic stenosis)	Pulsing sensation concurrent with cardiac cycle
Muscular	Palatal myoclonus, stapedius or tensor tympani spasm, patulous eustachian tube	Clicking or low-pitched buzzing

Abbreviations: AOM, acute otitis media; AVM, arteriovenous malformation; MS, multiple sclerosis; NSAIDs, nonsteroidal anti-inflammatory drugs; OM, otitis media; TMJ, temporomandibular joint.

Adapted from Lockwood AH, et al. Tinnitus. *N Engl J Med.* 2002;347(12):904.

including dizziness, otorrhea, hearing loss, tinnitus, rhinorrhea, or other more anatomically distant complaints, are helpful.

Acute otitis media is diagnosed based solely on the history and physical examination. The American Academy of Pediatrics (AAP) states that the diagnosis of AOM requires an acute onset of symptoms, the presence of a middle ear effusion, and signs and symptoms of middle ear inflammation.¹² Presenting signs and symptoms include rapid onset of otalgia (commonly manifesting among nonverbal children by ear-pulling), irritability, fever, and — at times — by otorrhea. These are often accompanied or preceded by rhinorrhea, cough, or nasal stuffiness, making it difficult to differentiate AOM from a viral infection of the upper respiratory tract based on the history alone.

Otitis externa is diagnosed based on a history of rapid onset of symptoms over 48 hours. According to a 1992 prospective study of 48 patients, presenting symptoms included otalgia (70%), itching (60%), or aural fullness (22%). Hearing loss was present in only a minority of cases (32%).²¹

Foreign bodies in the ear come in many varieties, from beads to vegetable matter to insects. It is important to establish from the history what object was inserted and when, and whether any attempts were made previously to remove the object, since this information will guide the emergency clinician in deciding whether and how to attempt retrieval.

With hearing loss, the history should include the rapidity of onset, duration, and degree, as well as whether the deficit is confined to one ear or both ears. Considering that this presentation could be an isolated stroke, the patient should be queried about vascular risk factors.

Evaluation of tinnitus begins by differentiating objective tinnitus (real sounds that can be heard by the examiner with a stethoscope placed close to the patient's head and neck⁶) from subjective tinnitus (the perception of sound in the absence of a real acoustic stimulus). The causes of each type of tinnitus are listed in **Table 3, page 5**. The history should focus on characterizing the sound the patient hears; its onset, duration, pitch, and associated symptoms; and its effect on the patient's daily life. A medication history is essential, since this may identify the offending agent and may indicate toxic ingestion, as in the case of aspirin overdose.

When interviewing a patient who has suffered trauma to the ear, the most important historical data to obtain are a good description of the event and tetanus vaccination status.

Physical Examination

As for all patients, an examination of any complaints involving the ear begins with an assessment of vital signs and general appearance. Focusing on the ear, the pinna is inspected for signs of trauma or infec-

tion, and the mastoid process is percussed to elicit any signs of tenderness.

In performing otoscopy, the clinician should select the largest speculum that will fit in the external auditory meatus; this is especially true when AOM is suspected, because a good seal is needed in order to perform pneumatic otoscopy. The emergency clinician should ensure that all otoscopes are properly maintained; in one prospective study of 221 otoscopes, nearly half were not in proper working condition²² — clearly a barrier to proper examination. To straighten the canal, the emergency clinician retracts the pinna superiorly and posteriorly. When examining children, the hand holding the otoscope should be stabilized against the child's head so that if the child moves, the otoscope and examiner's hand move with him. A focused examination beyond the ear should be performed as indicated, keeping in mind that systemic disease can present with complaints of the ear, and that pain may be referred from multiple cranial nerves to the ear.

In evaluating a patient for AOM, the diagnosis is made by identifying a middle ear effusion and signs of inflammation on otoscopy. A bulging TM, decreased or absent movement of the TM, or an air-fluid level behind the TM signify a middle ear effusion, and the presence of otorrhea and AOM also suggests perforation. Although the effusion can also be diagnosed by tympanocentesis, there are no reports in the literature to support this practice in the ED. The use of pneumatic otoscopy to assess TM mobility, however, is strongly recommended by the AAP. If available, portable tympanometry is very helpful.

To perform pneumatic otoscopy, a rubber bulb attached to the otoscope is used to insufflate air into the ear canal and is then rapidly withdrawn. A normal eardrum will be seen to move easily upon this maneuver whereas no movement will be seen when an effusion is present. Inflammation of the middle ear is indicated by erythema of the TM or distinct otalgia that clearly originates in the ear and interferes with the patient's normal activity or sleep.¹² Drainage generally signifies the presence of a perforation, although visualization of the perforation may be difficult. One review noted that when results of several studies were pooled, the presence of abnormal color, position, and mobility of the TM yielded a positive predictive value for AOM of greater than 83%.²³ Once the diagnosis of AOM has been made, the examiner should search for complications by checking all cranial nerves, palpating the mastoid process for tenderness, and observing the pinna for proptosis.

It is important to differentiate AOM from erythema of the TM normally seen in a crying child and from OME. The former is less intense than the erythema associated with inflammation and will remit as the child calms down; the latter presents with the

same findings as in middle ear effusion but lacks the symptomatology and inflammation required for the diagnosis of AOM.²⁴

As for the outer ear, the most classic physical finding in OE is pain with traction on the pinna and pressure on the tragus. Other signs of ear canal inflammation include tenderness of the pinna and/or tragus, diffuse ear canal edema and/or erythema, as well as lymphadenitis, TM erythema, or surrounding cellulitis, with or without otorrhea.⁴ In the patient with otomycosis, discharge (otorrhea) may be present, and otologic microscopy (although not available in most EDs) may reveal dirty white or gray debris sprouting hyphae (in candidal infections) or a plug dotted with black- or rust-colored spores found in *Aspergillus* infections.¹⁵ The physical examination can also differentiate between several other infectious and inflammatory conditions of the outer ear including auriculitis and polychondritis, with important consequences for treatment. Early malignant OE may appear similar to acute OE on examination, and it should be suspected in diabetic and immunocompromised patients, especially when pain is severe or in the case of any cranial nerve deficits.

Objects placed in the ear can cause significant discomfort due to local irritation, injury to the TM, infection, or any combination of these. In evaluating a reported foreign body in the ear, the emergency clinician should proceed with otoscopy, making note of the type of object, its location in the external auditory canal, and any injury to the wall of the external auditory canal or the TM that might have occurred prior to the examination. In children, be sure to make a thorough search for possible foreign bodies elsewhere (eg, contralateral ear, nares), since the finding of multiple simultaneous foreign bodies has been reported.²⁵

The evaluation of a patient with sudden loss of hearing should begin with a careful physical examination, paying special attention to the identifiable causes listed in **Table 2, page 4**. Standard Rinne and Weber tests of hearing loss may be useful. For the Rinne test, a vibrating 512-Hz tuning fork is placed on the mastoid process, assessing bone conduction, and then in front of the ear, assessing air conduction. Normally, the patient will be able to hear the latter sound louder, since air conduction is better than bone conduction. Next, to perform the Weber test, the vibrating tuning fork is placed on the center of the forehead and the patient is asked whether he perceives the sound on a particular side. Sound will lateralize to the affected ear in conductive hearing loss and away in sensorineural loss. If possible, arrange an audiologic evaluation before treatment to establish a baseline for later comparison by the otolaryngologist. One author recommends the following as a convenient bedside assessment of hearing: test the hearing by rubbing

the fingers together beside each ear or whispering numbers and asking the patient to repeat them. Then ask the patient to hum and indicate whether the sound is louder in one ear. For conductive hearing loss, humming will lateralize to the affected ear. For sensorineural hearing loss, humming will be heard more loudly in the unaffected ear.²⁶

For patients complaining of either tinnitus or sudden hearing loss, a full neurologic examination is indicated to search for a central source for the symptoms. It should be noted that an ischemic event along the auditory pathway has not been clearly shown to present as sudden SSHL in isolation (ie, without vertigo or other neurologic deficits), and there have been no such cases in the authors' collective experience.

Diagnostic Studies

Only a few patients who present with ear complaints will require diagnostic testing in the ED. The majority can be diagnosed and treated based on their history and physical examination alone, or they can safely be discharged for outpatient evaluation.

Imaging

According to a 1976 retrospective study of 1220 cases of SSHL cited in a 2008 review, a retrocochlear etiology is present in only 1% of patients with SSHL.²⁶ Consequently, radiologic studies will rarely be indicated unless specifically recommended after consultation with an ear, nose, and throat (ENT) specialist. Patients who present with sensorineural hearing loss of sudden onset whose present and past medical history includes vascular disease or risk factors should be evaluated for a possible ischemic event. Magnetic resonance imaging (MRI) is recommended; however, treatment should not be delayed if MRI is not immediately available.²⁶ If the patient has isolated hearing loss with no associated neurologic signs or symptoms and an otherwise reassuring history, imaging can be safely delayed until outpatient follow-up with an ENT specialist.

Similarly, for patients with tinnitus and other neurologic findings that raise concern about possible stroke, neuroimaging is indicated. Imaging will detect the cause of pulsatile tinnitus approximately 40% of the time. Computed tomography (CT) of the head and neck with intravenous (IV) contrast appears to be the test of choice,^{27,28} based on a recent prospective study of 16 patients²⁹ and a retrospective study of 54 patients with pulsatile tinnitus.³⁰

Blood Tests

For patients who present with tinnitus, it is reasonable to consider aspirin toxicity as well as high-output states such as anemia and hyperthyroidism. Consideration should be given to obtaining aspirin

serum levels, hemoglobin levels, and thyroid function tests, based on the patient's presentation.

Treatment

Otalgia

Otitis Media

Acute Otitis Media

The treatment of AOM begins by managing the patient's pain — a “strong” recommendation by the AAP.¹² Remedies such as acetaminophen and ibuprofen are commonly used, although a randomized controlled trial of 219 children showed only a trend toward efficacy for either of these analgesics versus placebo.³¹ Topical lidocaine drops were shown to be effective in one study,³² as is true for other topical anesthetics, although these can, at times, complicate follow-up evaluations. There is scant literature regarding the use of stronger (ie, opiate) analgesics, so clinical judgment and an assessment of an individual patient's likely risks of harm and benefit must guide treatment choices for those with moderate to severe pain. There are few data to support the use and effectiveness of various home remedies or homeopathic and naturopathic agents.^{12,33}

The decision to treat AOM with antibiotics is currently an area of some controversy. The AAP gives an “option” level of support to the “wait-and-see” strategy in which patients are given a prescription to take home but are advised to defer taking the antibiotic unless symptoms persist for 48 to 72 hours.¹² Implementation of this strategy in children between 6 months and 2 years of age is limited to healthy children with less-severe illness (fever < 39°C [102.2°F] and mild otalgia) and an uncertain diagnosis of AOM. Using this strategy for children older than 2 years of age, initial antibiotic treatment is only necessary when symptoms are severe at presentation and the diagnosis of AOM is certain; all others may be treated with a “wait-and-see” approach.

The strongest support for this strategy comes from one well-designed study of 283 patients 2 months to 12 years of age who were randomly assigned to either the wait-and-see prescription or a standard prescription.³⁴ It showed that the decrease in the number of prescriptions filled did not lead to an increase in fever, otalgia, or unscheduled visits for medical care. In addition, a meta-analysis by the Agency for Healthcare Research and Quality (AHRQ) demonstrated antibiotic therapy's relative lack of usefulness by reporting that the number of patients that needed to be treated to avoid 1 clinical failure was 8.³⁵ In all cases, the provider must be able to communicate with parents so they can obtain medication conveniently, if necessary.

The observation strategy has not been shown to be associated with any significant increase in the risk of meningitis or mastoiditis, although studies

to date have not included enough patients to reliably exclude the possibility of a small increase in these rare outcomes.^{34,35} One retrospective study of 2,622,348 children in Great Britain's national general practice database suggested that it would be necessary to treat nearly 5000 cases of OM to prevent a single case of mastoiditis. This study did not address whether the effect of delaying antibiotic therapy (as suggested by the wait-and-see approach) would be similar to the effect of omitting it altogether.³⁶

If antibiotics are prescribed, amoxicillin (80-90 mg/kg/day in 2 doses by mouth) is the recommended first-line therapy, although standard therapy should be tailored to local resistance patterns. (See Table 4.) The results of studies on duration of therapy are variable but point to a benefit with 10 days of therapy in children younger than 5 years of age and for those with severe disease, and 5 to 7 days in others.³⁷⁻⁴⁰ If the patient fails to respond within 2 to 3 days, the diagnosis should be reconsidered or the antibiotic strategy altered. Ceftriaxone (50 mg/kg/day IV or intramuscularly for 3 days) can be used if oral antibiotics cannot be tolerated. The AAP makes no specific recommendation to modify the antibiotic regimen for children with tympanostomy tubes. While a well-performed Canadian review of 6 randomized controlled trials determined that children with tympanostomy tubes and AOM should be treated with topical quinolone drops and steroids instead of oral antibiotics,⁴¹ the practice at the authors' institution is to use both topical and systemic antibiotics, pending further evidence to the contrary.

Otitis Media With Effusion

Otitis media with effusion does not require antibiotics or other emergency treatment. According to

Table 4. Antibiotic Therapy In Acute Otitis Media

First-line therapy:

Amoxicillin 80–90 mg/kg/day in 2 doses

If patient is allergic to penicillin:

Moderate allergy:

Cefdinir 14 mg/kg/day in 1-2 doses

Cefpodoxime 10 mg/kg/day in 1-2 doses

Cefuroxime 30 mg/kg/day in 2 doses

Severe allergy:

Azithromycin 10 mg/kg/day on day 1, then 5 mg/kg/day for 4 days

For moderate to severe otalgia, with temperature > 39°C (102.2°F), or persistent symptoms:

Amoxicillin-clavulanate 90 mg/kg/day in 2 doses

For patients with tympanostomy tubes:

Ciprofloxacin/dexamethasone 4 drops in the affected ear 2 times per day for 7 days

the AAP, a review of multiple cohort studies by the AAO-HNS supports 3 months of monitoring before treatment, corroborated by level B evidence. The AAO-HNS also found that multiple randomized controlled trials showed no benefit from the use of antihistamines or decongestant therapy. Children and adults should therefore be reassured and referred to their pediatricians or primary care providers.²⁴ Frequently, patients with OME are advised not to fly or dive, but a small study of 171 patients with OME and other conditions that chronically affect middle ear pressures showed that none suffered barotrauma during air travel.⁴² Tympanostomy tubes are the first-line surgical therapy for persistent OME or OME in patients at high risk. (See Table 5.)

Otitis Externa

Otitis externa is managed primarily with gentle cleaning, suctioning of debris from the ear canal, and, most often, topical antibiotics and analgesics. Mild-to-moderate pain is most often controlled with oral nonsteroidal anti-inflammatory drugs (NSAIDs) or acetaminophen but can sometimes become severe enough to require opiates.

Topical antimicrobial therapy is the first-line treatment for diffuse, uncomplicated OE without significant swelling of the ear canal. Meta-analyses by the AAO-HNS of 2 early trials of topical therapy versus placebo showed that only 2 patients needed to be treated to achieve 1 cure.^{44,45} Choosing which antibiotic to use depends on local practice, since studies have not identified any particular agent that is clearly more efficacious or has a better side effect profile,⁴ but the choice should provide coverage for staphylococcal and pseudomonal infections. A systematic review of 18 trials revealed no difference in the clinical outcome with an antiseptic (such as acetic acid) versus an antibacterial (such as an aminoglycoside) or with a steroid plus an antimicrobial versus an antimicrobial alone, although it did show benefit with an antimicrobial plus a steroid over a steroid alone.^{4,46} Steroids do seem to reduce the duration of pain and itching.⁴⁷

In summary, for uncomplicated OE, multiple options for topical treatment appear to be equally effica-

Table 5. Indications For Tympanostomy Tube Placement In OME⁴³

- Children with OME lasting 4 months or longer, with persistent hearing loss or other symptoms
- Recurrent or persistent OME in children at high risk*
- OME with structural damage to the TM or middle ear

* "High risk" includes children with developmental or speech and language delay, permanent hearing loss, autism spectrum disorder, blindness, or craniofacial disorders, including Down syndrome.

Abbreviations: OME, otitis media with effusion; TM, tympanic membrane.

cious, including antiseptics and both quinolone and nonquinolone antibiotics, with or without steroids. The authors' practice is to use a neomycin-polymyxin B-hydrocortisone solution when there is no TM perforation or granulation tissue; if there is any concern about TM perforation, fluoroquinolone drops can be used to avoid the ototoxicity associated with neomycin.

There is no evidence to support the use of systemic antibiotics in the management of uncomplicated OE. However, a survey of current practice in the US showed that up to 40% of cases of OE are treated both orally and topically and often with antimicrobials that do not cover *Staphylococcus* and *Pseudomonas*, the most common organisms in OE.⁴⁸ Based on level B evidence, the AAO-HNS recommends that therapy be altered for patients with diabetes, HIV infection, or immunocompromise, and a nonintact TM (eg, tympanostomy tubes, history of radiotherapy), because their risk for malignant OE or ototoxicity is greater. In these patients, concurrent administration of systemic and topical antibiotics would be appropriate.

One issue with topical drug delivery is that in OE, the ear canal is often blocked, necessitating removal of any foreign material, aural toilet, wick placement, or all 3. Aural toilet is performed with suction or with tepid water, saline, or hydrogen peroxide. A wick is inserted using bayonet forceps if a significant amount of canal edema obscures visualization of most of the tympanic membrane. A wick can be fashioned out of polyvinyl acetal polymer, ribbon gauze, or a rolled 2- by 2-inch piece of gauze, cut to size. Before placement, the wick is saturated with a topical antibiotic/steroid suspension such as ciprofloxacin/dexamethasone. Neomycin is avoided here, as in other cases in which TM disruption is suspected or confirmed (ie, perforation or tympanostomy tube), because visualization of the TM is difficult. (See Table 6.)

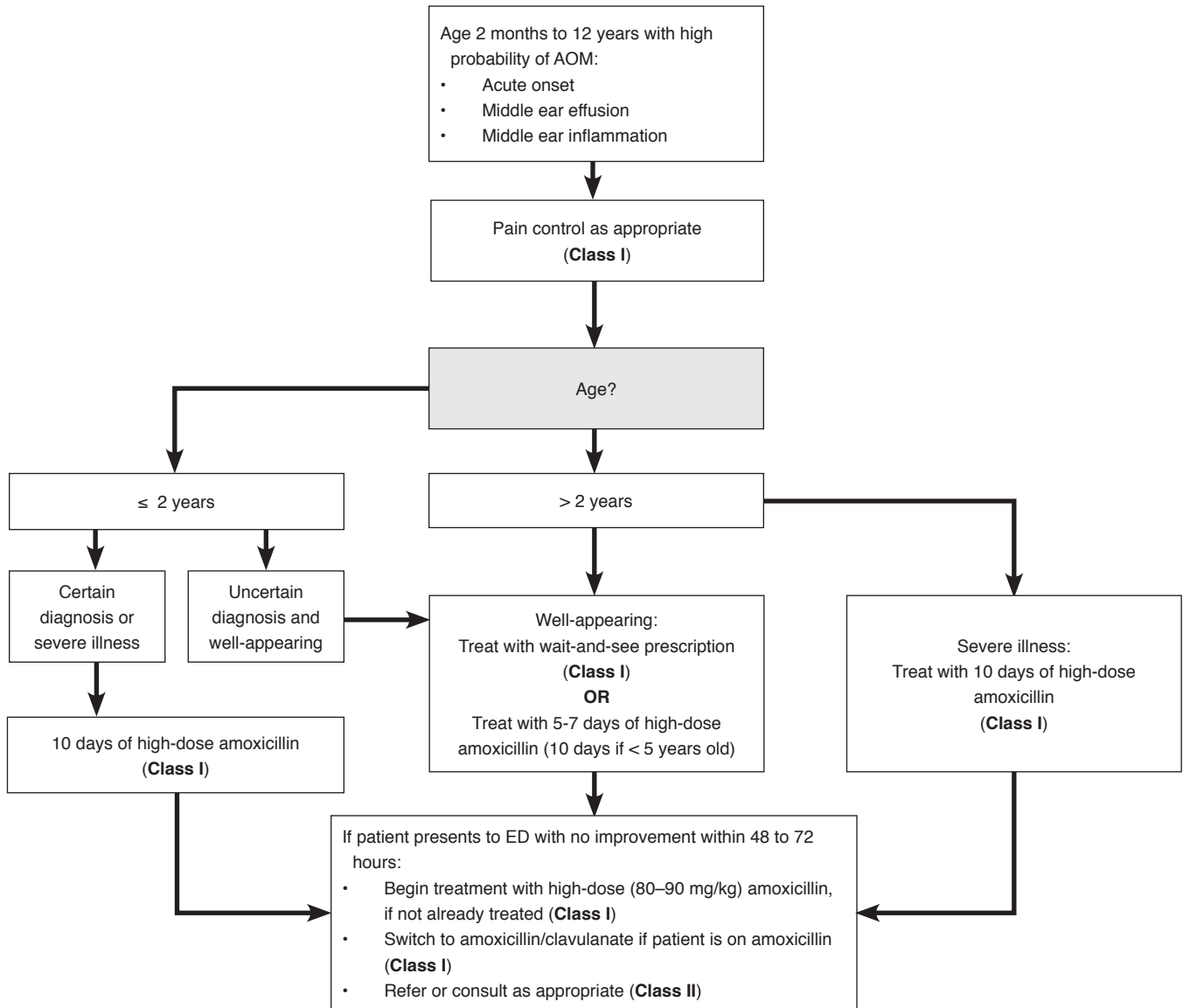
After 2 to 3 days, the patient should be reassessed by his or her physician or otolaryngologist.⁴⁷ Based only on expert opinion, swimmers are often advised to abstain from water exposure for 7 to 10 days. Similarly, people who wear hearing aids or earplugs thought to be the cause of OE should also be advised to abstain until symptoms improve.⁴

Malignant OE is a life-threatening emergency, and when it is suspected, emergent ENT consultation should be obtained for confirmation and further evaluation.

Table 6. Ototoxic Treatment To Be Avoided In Possible Or Confirmed Rupture Of The TM

- Aminoglycosides (eg, neomycin)
- Alcohol
- Compounds with low pH (including acetic acid and many other antiseptics)

Clinical Pathway For Treatment Of Acute Otitis Media



Class Of Evidence Definitions

Each action in the clinical pathways section of *Emergency Medicine Practice* receives a score based on the following definitions.

Class I

- Always acceptable, safe
- Definitely useful
- Proven in both efficacy and effectiveness

Level of Evidence:

- One or more large prospective studies are present (with rare exceptions)
- High-quality meta-analyses
- Study results consistently positive and compelling

Class II

- Safe, acceptable
- Probably useful

Level of Evidence:

- Generally higher levels of evidence
- Non-randomized or retrospective studies: historic, cohort, or case control studies
- Less robust RCTs
- Results consistently positive

Class III

- May be acceptable
- Possibly useful
- Considered optional or alternative treatments

Level of Evidence:

- Generally lower or intermediate levels of evidence
- Case series, animal studies, consensus panels
- Occasionally positive results

Indeterminate

- Continuing area of research
- No recommendations until further research

Level of Evidence:

- Evidence not available
- Higher studies in progress
- Results inconsistent, contradictory
- Results not compelling

Significantly modified from: The Emergency Cardiovascular Care Committees of the American Heart Association and repres-

tatives from the resuscitation councils of ILCOR: How to Develop Evidence-Based Guidelines for Emergency Cardiac Care: Quality of Evidence and Classes of Recommendations; also: Anonymous. Guidelines for cardiopulmonary resuscitation and emergency cardiac care. Emergency Cardiac Care Committee and Subcommittees, American Heart Association. Part IX. Ensuring effectiveness of community-wide emergency cardiac care. *JAMA*. 1992;268(16):2289-2295.

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Copyright © 2010 EB Practice, LLC d.b.a. EB Medicine. 1-800-249-5770. No part of this publication may be reproduced in any format without written consent of EB Practice, LLC d.b.a. EB Medicine.

Treatment of otomycosis begins on diagnosis in the ED and continues on follow-up with otolaryngology. Discharge and foreign debris are meticulously suctioned from the canal, after which nystatin/triamcinolone acetonide ointment is placed in the canal, with further follow-up in 7-10 days.

Other Conditions Of The External Ear That Cause Otalgia

While OE refers to infections of the external ear canal, infectious or inflammatory conditions can also affect the auricle or pinna with or without including the canal. In these cases, topical drops are ineffective. Auriculitis is a cellulitis of the external auricle and is treated – as for any other cellulitis – with systemic antibiotics, with consideration of methicillin-resistant *Staphylococcus aureus* (MRSA) when appropriate. Abscesses of the external ear canal and preauricular pits (embryologic remnants that appear as small dimples anterior to the pinna) require incision and drainage with wick placement. Follow-up with an ENT specialist is recommended if there is no improvement within 48 to 72 hours.

Polychondritis is an autoimmune inflammatory condition. Although biopsy is ultimately necessary for definitive diagnosis, a few clues can suggest the disorder. First, because the ear lobule has no cartilage, it is usually spared in this disease. Second, the disease may affect anatomically separate

Figure 3. Mastoiditis



B. Welleschik, 2006. Reprinted with permission under Creative Commons License 3.0, Wikimedia Commons, <http://commons.wikimedia.org/wiki/User:Welleschik/images/Otologie>

areas, such as the contralateral ear, nose joints, or respiratory cartilage. Finally, patients with relapsing polychondritis may suffer from other autoimmune diseases. Treatment is beyond the scope of most emergency clinicians but may involve steroids or immunosuppressants.

Mastoiditis

Mastoiditis occurs rarely as a complication of inadequately treated OM, although it may be the first presentation of OM. (See Figure 3.) According to a retrospective cohort study in the UK, mastoiditis occurs in 1.8 per 10,000 childhood cases of untreated OM.³⁶ Patients present with ear pain, mastoid tenderness, proptosis of the pinna, and air fluid levels in the mastoid air cells on CT scan. While radiographic air-fluid levels are characteristic of this entity, they are not specific for the illness and can be seen in other upper respiratory diseases or AOM. In a well-appearing patient without other clinical signs of mastoiditis, the isolated or incidental finding of air-fluid levels on CT should not prompt a change in treatment.

Mastoiditis is treated with IV antibiotics and urgent consultation with an otolaryngologist to determine the need for surgical intervention.⁴⁹ In one strategy, the ENT specialist performs a myringotomy for aspirate and fluid cultures, and broad-spectrum antibiotics are administered, often a third-generation cephalosporin. Antibiotic regimens should cover *S pneumoniae*, the most common pathogen. Given the rarity of the disease in this postantibiotic era, diverse regimens have been suggested, from clindamycin to ceftriaxone, vancomycin, and imipenem. The choice should be made after considering the patient's comorbidities and the hospital's microbiology biogram.

Perichondritis

Perichondritis is an infection of the cartilage and subcutaneous tissue that often results from any process that disrupts the cartilage-perichondrium vascular relationship and allows skin flora to enter this space (eg, ear piercing, surgery, burns, and trauma). It presents as pain, erythema, and local warmth and usually occurs 3 to 4 weeks after the injury. It is this history that differentiates perichondritis from auriculitis, though the distinction is difficult to make clinically. This infection produces severe swelling and can potentially lead to focal necrosis of the ear. Treatment consists of systemic antibiotics, often with fluoroquinolones, to cover *Pseudomonas* (the most common source) and skin flora. Consultation with an ENT specialist for surgical drainage is required for abscess and for management of immunocompromised patients or signs of systemic toxicity.⁵⁰

Herpes Zoster Oticus (Ramsay Hunt Syndrome)

This reactivation of latent *Human herpesvirus 3* (varicella-zoster virus) infection in the geniculate

ganglion should be considered in cases of otalgia with vesicular eruption.⁵¹ Facial nerve palsy may precede the rash, and symptoms associated with an involved eighth cranial nerve can include vertigo, hearing loss, tinnitus, nausea, vomiting, and nystagmus.⁵² As in varicella-zoster elsewhere in the body, treatment with acyclovir or valacyclovir is recommended, if begun early, to shorten the duration of symptoms and decrease the likelihood of postherpetic neuralgia.^{53,54} A 2008 Cochrane Review found no RCTs that looked at the addition of corticosteroids to antivirals, so no recommendation can be made for or against their use.⁵⁵

Foreign Body

An important initial consideration in the management of a patient with a foreign body in the ear is whether any attempt should be made to remove it prior to referral to an ENT specialist. One ENT-authored retrospective study published in 2002 included 698 ED or clinic patients and identified the following criteria for primary referral: spherical or sharp-edged object, any vegetable matter or disk-shaped battery, location adjacent to the TM, time in the ear exceeding 24 hours, patient aged less than 4 years, or any previous unsuccessful removal attempts, all of which were reportedly associated with increased complications.²⁵ A single-center retrospective review of pediatric ED patients showed no increase in complication rates related to patient age or length of time the object was in the ear, and the authors recommended referral to an ENT specialist if more than one attempt or method would be needed to retrieve the object.⁵⁶ Facility with an otic speculum and a headlamp is a key advantage in foreign body removal and may indicate the need for ENT referral if initial attempts are unsuccessful.

Two general rules attend the removal of any foreign body. First, the external meatus is the narrowest portion of the canal and represents the most difficult obstacle during extraction. Second, smaller instruments are more likely to cause damage to the canal, so the operator should use the largest, bluntest instrument having the potential to grasp the object or to pass a hook behind it.

Disk-shaped batteries deserve special emphasis because of their ability to rapidly produce burns or liquefactive necrosis of the external auditory canal.⁵⁷ It is important to note that it is the battery's electrical potential that is damaging, and that batteries do not need to rupture or leak to cause damage.

Once the decision is made to attempt removal, multiple methods are available to the ED clinician. Achieving good, hands-free visualization is the key to success and can be accomplished with an inexpensive battery-operated headlamp if no operating ENT microscope is available. The ED clinician can grasp the foreign body with an alligator forceps or by passing a blunt right-angle hook beyond the object to

pull it out, in either case using the largest instrument possible. Suction catheters can be used, but are often unsuccessful for most objects. Alternatively, one may irrigate the canal by directing a stream of warm water past the object. (The water is warmed to avoid inducing vertigo.) This method should not be employed for disk batteries or vegetable matter, which may expand when wet, or if the patient is known or suspected to have a TM perforation.

Live insects should be paralyzed and killed with lidocaine (2% gel or liquid) or mineral oil prior to removal attempts. In one study conducted in vitro, ethanol provided the most rapid killing of most insects,⁵⁸ but the ototoxic properties of alcohol make this method inferior except in rare cases in which the TM is known to be intact. After removal of the foreign body, the ED clinician should inspect the external ear canal again for any signs of damage to or infection of the canal or TM and provide appropriate treatment as needed. A single application of topical antibiotics can be used as prophylaxis for minor canal irritation.

Temporomandibular Joint Disorders

Disorders of the temporomandibular joint (TMJ) can present as pain referred to the ear. This diagnosis should be suspected when the ear is found to be normal on examination and when one can hear clicking of the jaw on mouth opening in patients with malocclusion and when there is tenderness over the joint on external and intraoral examination. Internal palpation is performed by running the finger along the mandible toward the coronoid process, where tenderness is most severe. Patients with TMJ dysfunction should be advised to take NSAIDs and follow a soft diet and should be referred to their dentist for further evaluation. Some clinicians recommend warm compresses for symptomatic relief.⁵⁹

Hearing Loss

When a specific cause for hearing loss is identified, treatment is naturally targeted to that cause. In cases of traumatic conductive hearing loss, a significant fraction will resolve without treatment, as evidenced by a retrospective review of 45 patients in whom audiologic examination showed improvement in 77% of ears without intervention.⁶⁰

The most common cause of hearing loss is cerumen impaction, and although many methods have been put forward for treating this condition, none have been found to be superior to any other based on reliable evidence. In fact, a Cochrane Review of 9 trials, all of which were poor quality, assessed the benefits of various agents used in the treatment of cerumen impaction, including triethanolamine peptide, sterile water, sodium bicarbonate, and other substances. No single agent was found to be superior. This is probably because all techniques are

likely to be effective to some extent. Irrigation can be performed in the ED using a 60-mL syringe filled with warm saline and attaching an irrigation tip that will fit just inside the meatus to avoid accidentally piercing the TM. This procedure is contraindicated in patients with TM perforation, chronic middle ear infection, or unilateral deafness (to preserve the functioning ear).⁶¹

Multiple agents have been tried in the treatment of idiopathic SSHL, but clear evidence showing benefit with any of them is lacking. A Cochrane Review of the use of steroids found only 2 trials, and their results were conflicting.⁶² Multiple reviews do still recommend beginning prednisone at 60 mg and tapering the dose over 10 to 14 days, but there are few other treatment options available.²⁶ In addition, a well-performed meta-analysis showed that antiviral agents provide no benefit as adjuncts to corticosteroid therapy based on existing evidence.⁶³

Hyperbaric oxygen (HBO) has been postulated to provide some benefit based on the hypothesis that a hypoxic event is the cause of cochlear dysfunction in idiopathic SSHL; however, there is little evidence to support this, and the use of HBO should not be pursued at this time as an emergent treatment except in cases of acute hearing loss related to diving barotrauma (see Barotrauma, page 15). A Cochrane Review of studies performed since 1960 did find limited evidence for benefit with HBO—that is, 5 patients needed to be treated to improve 1 person's hearing by 25%—but the effect was not clearly functionally important. Because of this, they did not recommend using HBO as a routine treatment.⁶⁴ Patients should be referred to an otolaryngologist if symptoms persist.

Tinnitus

Emergency department management of tinnitus is needed only for life-threatening conditions such as carotid artery dissection, aspirin overdose, and anemia. In one study, 16 of 136 consecutive patients with arterial dissection in the neck presented with pulsatile tinnitus.⁶⁵ Patients who are not suspected of having one of the aforementioned causes can be discharged home with a referral for outpatient otolaryngologic and audiologic evaluations.

Few evidenced-based options are available to the emergency clinician for the symptomatic treatment of tinnitus. Antiarrhythmics, benzodiazepines, tricyclic antidepressants, and alternative therapies such as *Ginkgo biloba* and acupuncture all have been shown in RCTs to perform no better than placebo in the treatment of tinnitus.⁶⁶⁻⁷¹ Moreover, there is insufficient evidence to support HBO therapy as a potential treatment.⁷² In one study, simply providing patients with written information on tinnitus made them more comfortable dealing with the condition, even though there was no decrease in symptoms.⁷³

Ear Trauma

Lacerations Of The External Ear

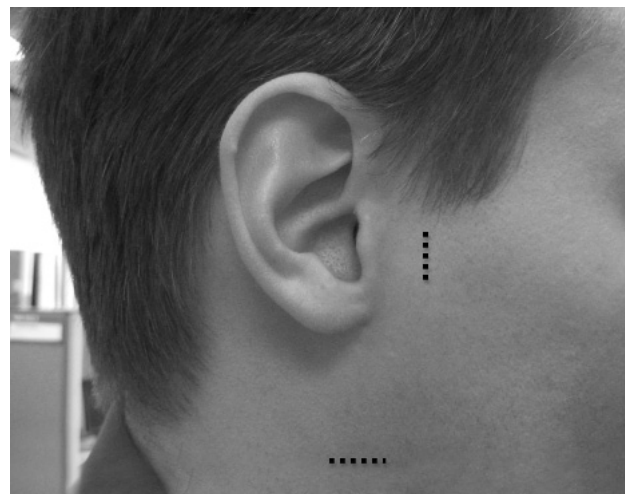
Achieving a proper cosmetic repair of the ear is as important as at any other anatomic site. In repairing lacerations of the pinna, the emergency clinician should focus on restoring contact between the cartilage and its overlying perichondrium to maintain the blood supply to the cartilage.

Anesthesia of the external ear can best be attained by a circumferential ring block around the base of the pinna. A greater auricular nerve block can be achieved by injecting a local anesthetic subcutaneously into the midsternocleidomastoid area, 6.5 cm inferior to the meatus, accompanied by a subcutaneous injection 2.5 cm anterior to the tragus (over the space between the condyle and coronoid process of the mandible). This will anesthetize the remainder of the ear via the auriculotemporal nerve block (a branch of V3).⁷ (See Figure 4.) Most textbooks recommend avoiding the use of epinephrine as an adjunct for hemostasis when anesthetizing the ear, although hard evidence to support this is scant.^{74,75}

Adequate irrigation is important, especially in through-and-through lacerations. A cotton ball should be placed in the external auditory canal to prevent discomfort and to prevent an occlusive clot from forming. Avoid trimming the skin or cartilage as you might for wounds in other anatomic locations, since trimming can result in disfigurement.

Reapproximation begins with the cartilage itself. If suturing the overlying skin will leave a defect in the cartilage beneath, primary closure of the cartilage should be performed. Place 4-0 or 5-0 absorbable sutures beginning at anatomic folds or grooves

Figure 4. Injection Sites For Alternative Methods Of Anesthesia



Dashed lines indicate injection sites for great auricular and auriculotemporal nerve blocks, as described in the text.

Reprinted with permission from Jeffrey Siegelman, MD.

in the cartilage. Stitches should include the anterior and posterior perichondrium, if possible. Repair the skin from posterior to anterior with 5-0 or 6-0 non-absorbable interrupted sutures. Consultation with a facial plastic surgeon or otolaryngologist is recommended for wounds in which significant tissue loss prevents adequate closure with a good cosmetic effect. The wound is dressed with a pressure dressing, similar to that used for an auricular hematoma (see below). While there is scant evidence for the practice, current practice is to recommend prophylactic antibiotics for ear lacerations with exposed cartilage, with coverage for typical skin flora.⁷⁶

Auricular Hematoma

Blunt trauma to the external ear can result in an auricular hematoma, a collection of blood between the cartilage and the perichondrium. (See Figure 5.) As noted earlier, a separation occurring at this level can leave the cartilage devoid of its vascular supply. This causes fibrosis, contracture, and neocartilage formation, resulting in the so-called "cauliflower ear." Thus, prompt and proper evacuation and repair are essential.

Simple needle aspiration of the hematoma is often cited as the initial recommended treatment, although in one study this procedure failed in 75% of cases.⁷⁷ One explanation for failure, as described in a retrospective review of 10 patients in whom at least 1 attempt at needle aspiration failed, is that in some cases the hematoma forms within the cartilage itself instead of in the subperichondrial space.⁷⁸ We recommend evacuation of the hematoma by incision and drainage, with the incision

Figure 5. Auricular Hematoma



Reprinted with permission from Jeffrey Siegelman, MD.

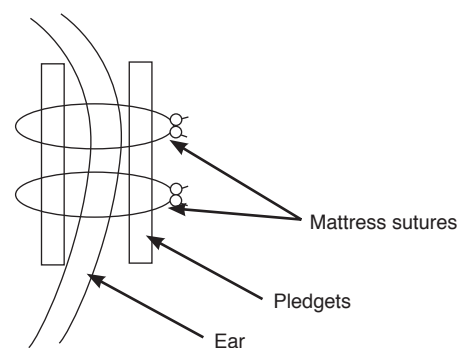
made along an anatomic crease to avoid a conspicuous scar after healing. Following drainage, a 1/4" Penrose drain is placed, to be removed 1 to 2 days later. Cotton pledgets (cotton dental rolls) are then sutured onto both sides of the ear using 3-0 nylon and a straight needle; these are left in place, as shown in Figure 6, to prevent the reaccumulation of blood. A bulky pressure dressing is then applied for 12 to 24 hours, and the patient is referred for outpatient follow-up.

To fashion a bulky pressure dressing for the ear, moist or petrolatum-coated cotton is placed in the fissures of the ear until it is flush, cotton gauze is placed behind the ear, and a circumferential bandage is placed around the head, without covering the opposite ear.⁷ One study supports closure with mattress sutures after incision and drainage to ensure a good aesthetic result.⁷⁷ Systemic antibiotics such as cephalexin are often prescribed prophylactically for as long as the drain is in place, although this is not a well-studied intervention and lacks good supporting evidence.

Tympanic Membrane Perforation

Traumatic TM perforation can result from a direct blow to the ear, barotrauma, air travel during an upper respiratory infection, or blast injury, as well as the more common cause of the aggressive use of cotton swabs to clean the ear. The vast majority of TM ruptures heal spontaneously, especially radially oriented linear perforations; however, a prospective study of 53 patients with traumatic TM perforation showed that large or central lesions are less likely to do so, as are those in the elderly.⁷⁹ For the emergency clinician, management consists of making the diagnosis, providing reassurance, referring to an otolaryngologist for follow-up, and counseling to avoid water exposure for 4 to 6 weeks. In addition, topical ototoxic preparations should be avoided in these patients. (See Table 6, page 9.) Topical antibiotics are often pre-

Figure 6. Technique For Bolster Of A Drained Auricular Hematoma



Reprinted with permission from Daniel Lindberg, MD.

scribed if the perforation occurred in a contaminating setting, such as water-skiing, but again, this use of antibiotics is not supported by evidence.

Barotrauma

Barotrauma to the ear is most commonly the result of air travel with an upper respiratory infection or upper airway congestion, scuba or free diving, blast injury, or, rarely, hyperbaric chamber therapy. In blast injuries, the importance of diagnosing a TM rupture is less for guiding therapy of the ear itself than in the prognosis of other injuries. The TM is the body's most sensitive pressure transducer and is more likely to be injured at lower pressures than any other organ. In blasts with multiple victims, otoscopic examination has been suggested as a triage

tool in well-appearing victims to identify patients at higher risk of developing delayed symptoms due to pulmonary or gastrointestinal injuries.⁸⁰ However, while the eardrum is a convenient prognostic tool, 2 series suggest that it is not perfect.^{81,82} As with other causes of TM perforation, perforations from blast injury are likely to heal spontaneously.

Divers can experience injury from failure to regulate pressure in the outer, middle, or inner ear. With outer or middle ear dysfunction, the TM bulges inward or outward, respectively, and can lead to rupture and bloody otorrhea. Management is similar to that for other causes of TM rupture. Divers with inner ear symptoms (eg, vertigo, hearing loss, or tinnitus) may have suffered from inner ear barotrauma (on descent) or decompression injury (on

Risk Management Pitfalls For Ear Complaints In The ED

1. **"I thought compression would help his swollen ear."**

Do not overlook an auricular hematoma; it must be incised and drained. This is an easy fix, but if left untreated, is likely to result in a cauliflower-ear deformity.

2. **"The ear looked fine; I couldn't find a cause for his pain."**

Remember to look for sources of referred pain in patients who present with otalgia but have a normal ear examination. The ear shares sensory innervation with multiple cranial nerves, and pain can commonly be referred from the pharynx, the TMJ, and even the thyroid gland.

3. **"I told him to follow up for his tinnitus — wasn't that enough?"**

Know which patients presenting with tinnitus to worry about. Be on the lookout for carotid artery dissection, aspirin toxicity, and anemia, all of which can be manifest as tinnitus. These diagnoses need to be ruled out before the patient is referred for outpatient follow-up.

4. **"I thought I knew where it was in the canal."**

If you can't see it, don't go after it. When attempting to remove a foreign body from the external ear canal, do not blindly insert instruments without proper visualization, since damage to the TM or ossicles can result in hearing loss. If you can't easily access the foreign body, refer the patient to an otolaryngologist.

5. **"My own toddlers have bruises all over their foreheads, why should I worry about a few bruises on the ear?"**

Remember to consider nonaccidental trauma in children who present with ear injuries, because doing so may save a life.

6. **"I saw most of the TM so I didn't think there was a perforation."**

When prescribing topical medications for the ear, first consider a possible perforation of the TM; if this cannot be ruled out, avoid ototoxic preparations.

7. **"I gave the mother a wait-and-see prescription, but she didn't fill it."**

Remember that the wait-and-see prescription is not appropriate for everyone. It's important to consider whether the family has good follow-up, access to pharmacies, and the ability to determine whether or not the child is improving.

8. **"It was a really busy night and I didn't have time to walk the patient."**

The possibility of focal neurologic deficits is a key factor in determining whether certain ear complaints, especially tinnitus and SSHL, require more emergent evaluation. Furthermore, when stroke is a possibility, consider specialist consultation as well.

9. **"I gave her drops for her OE; that has always worked for my patients before."**

When treating patients with OE, remember that diabetics and immunocompromised patients will require systemic therapy, since this infection can easily spread to bone, brain, and elsewhere, and these patient groups are at higher risk for such complications.

ascent). The Diver's Alert Network (DAN) staffs a hotline for cases of suspected dive-related emergencies. The emergency clinician can call 1-919-684-4986 (24 hours a day, 365 days a year) to speak with dive medicine experts.

Special Circumstances

Pediatrics

Despite epidemiologic differences between children and adults with respect to many of the disorders described above, the evaluation and management for these 2 age groups are remarkably similar. Conversely, the significance of bruising or trauma to the ear in young children is vastly different from that in adults. Bruising anywhere on the body is rare in children who are less than 6 months old and not yet cruising⁸³; bruising of the pinna is a specific red flag for abuse in a child of any age.⁸⁴⁻⁸⁶ One of the earliest described syndromes of child abuse was the "tin ear syndrome" characterized by bruising of the pinna, traumatic brain injury, and retinal hemorrhages.⁸⁷

With this in mind, it bears noting that blood can gravitate from a parietal scalp hematoma and settle at the base of the scalp around the mastoid, mimicking the Battle sign; in the same way a frontal hematoma can progress to mimic another sign of basilar skull fracture, periorbital ecchymoses, or "raccoon eyes."

Young children with bruising to the pinna should be evaluated carefully for other signs of inflicted injury. Children less than 2 years of age should undergo a skeletal survey.⁸⁸ Neuroimaging and ophthalmologic examination are warranted for young children without a history of a consistent injury witnessed by a disinterested observer. Older children might benefit from skull x-ray or neuroimaging to evaluate for skull fracture or traumatic brain injury.

Pregnancy

In the pregnant patient who presents with ear complaints, the emergency clinician must consider the effects of any prescribed pharmacotherapy on the fetus. Preferred antibiotics include penicillins, amoxicillin/clavulanate, and the macrolides, which

are all category B (with the exception of erythromycin and clarithromycin). Benzodiazepines (category D) and systemic corticosteroids (category C) should be avoided, especially during the first trimester. Acyclovir is acceptable in pregnant patients who present with varicella-zoster.⁸⁹

Diabetes Mellitus

Patients with diabetes can have depressed immune system function. Although there is no strong evidence of atypical presentations of AOM in these patients, there are case reports of diabetic patients who present with altered mental status or fever due to mastoiditis that originated as AOM.⁹⁰ As mentioned earlier, malignant OE caused by *Pseudomonas* infection in these patients can be particularly devastating.

Controversies/Cutting Edge

The "wait-and-see" prescription for AOM in well-appearing children remains a developing story. Reliable data have already suggested that it is efficacious in both primary care and ED settings.³⁴ What remains to be seen is the impact of this strategy on the rate of complications of untreated AOM in the future. Rates of mastoiditis do not seem to be affected,³⁶ but the rates of other complications, such as hearing loss, remain unstudied. Vaccines to prevent AOM are currently being developed, but wide dissemination is probably years away.⁹¹

Summary

Complaints involving the ear range from the most common and easily treatable disorders, such as AOM, to quite severe conditions, such as carotid artery dissection. Emergency clinicians in all settings can rely on solid history and physical examination skills to address most complaints and to detect the much smaller percentage of patients who will require laboratory testing and imaging. An important role of the emergency clinician is to identify patients who require consultation with a specialist and those who can be followed as outpatients.

Time- And Cost-Effective Strategies

1. Reserve antibiotics for when they're really needed.
2. Order only those imaging and laboratory studies that will change management, and consider specialist consultation first to ensure that you order the correct study and thus avoid the need for reimaging.
3. For many patients with ear complaints, the majority of the work-up can be done on an outpatient basis; this is especially true for patients with tinnitus and hearing loss. Rule out what you need to, and arrange follow-up when it's appropriate.

Case Conclusions

You explained to the mother the benefits of a “wait-and-see” prescription, provided the child with analgesia, and sent them on their way to follow up with their pediatrician.

Next, you turned your attention back to the man with the ear laceration. After performing a ring block around the ear, you first repaired the cartilage and then repaired the skin, making sure to pay close attention to the folds of the ear. Tomorrow, when your patient sobers up, you’re sure he’ll appreciate your attention to aesthetics.

Finally, after further history-taking, you identified that the man with hearing loss has Wegener’s granulomatosis. You discussed the case with the patient’s rheumatologist, who recommended a course of prednisone for a presumptive vascular etiology, and you recommended the patient with a prescription and close follow-up.

References

Evidence-based medicine requires a critical appraisal of the literature based upon study methodology and number of subjects. Not all references are equally robust. The findings of a large, prospective, randomized, and blinded trial should carry more weight than a case report.

To help the reader judge the strength of each reference, pertinent information about the study, such as the type of study and the number of patients in the study, will be included in bold type following the reference, where available. In addition, the most informative references cited in this paper, as determined by the authors, are noted by an asterisk (*) next to the number of the reference.

1. Pitts SR, Niska RW, Xu J, et al. National Hospital Ambulatory Medical Care Survey: 2006 emergency department summary. *Natl Health Stat Report*. 2008;7(1):1-38.
2. Naschitz, JE, Yeshurun D. Occult infection in the facial area presenting as fever of unknown origin. *Isr J Med Sci*. 1985;21(12):995-998.
3. Schwartz LE, Brown RB. Purulent otitis media in adults. *Arch Intern Med*. 1992;152(11):2301-2304. **(Review)**
- 4.* Rosenfeld RM, Brown L, Cannon CR, et al. Clinical practice guideline: acute otitis externa. *J Am Acad Otolaryngol Head Neck Surg*. 2006;134(4 Suppl):S4-S23. **(Retrospective; 119.2 million patients)**
5. Hannan SA, Sami F, Wareing, MJ. Tinnitus. *BMJ*. 2005;330(7485):237. **(Retrospective; 5 patients)**
6. Crummer RW, Hassan GA. Diagnostic approach to tinnitus. *Am Fam Physician*. 2004;69(1):120-126. **(Review)**
7. Brown DJ, Jaffe JE, Henson JK. Advanced laceration management. *Emerg Med Clin North Am*. 2007;25(1):83-99. **(Guideline)**
- 8.* Rothman R, Owens T, Simel DL. Does this child have acute otitis media? *JAMA*. 2003;290(12):1633-1640. **(Review)**
9. Ely JW, Hansen MR, Clark EC. Diagnosis of ear pain. *Am Fam Physician*. 2008;77(5):621-628. **(Review)**
10. Klein JO. Otitis media. *Clin Infect Dis*. 1994;19(5):823-833. **(Review)**
11. Garbutt J, Rosenbloom I, Wu J, et al. Empiric first-line antibiotic treatment of acute otitis in the era of the heptavalent pneumococcal conjugate vaccine. *Pediatrics*. 2006;117(6):e1087-e1094. **(Prospective; 327 patients)**
12. American Academy of Pediatrics Subcommittee on Management of Acute Otitis Media. Diagnosis and management of acute otitis media. *Pediatrics*. 2004;113(5):1451-1465. **(Guideline)**
13. Osguthorpe JD, Nielsen DR. Otitis externa: review and clinical update. *Am Fam Physician*. 2006;74(9):1510-1516. **(Review)**
14. Martin TJ, Kerschner JE, Flanary VA. Fungal causes of otitis externa and tympanostomy tube otorrhea. *Int J Pediatr Otorhinolaryngol*. 2005;69(11):1503-1508. **(Retrospective; 166 patients)**
15. Kaur R, Mittal N, Kakkar M, et al. Otomycosis: a clinicomycologic study. *Ear Nose Throat J*. 2000;79(8):606-609. **(Prospective; 95 patients)**
16. Lee H. Sudden deafness related to posterior circulation infarction in the territory of the nonanterior inferior cerebellar artery: frequency, origin, and vascular topographical pattern. *Eur Neurol*. 2008;59(6):302-306. **(Retrospective; 7 patients)**
17. Lee H, Baloh RW. Sudden deafness in vertebrobasilar ischemia: clinical features, vascular topographical patterns and long-term outcome. *J Neurol Sci*. 2005;228(1):99-104. **(Retrospective; 29 patients)**
18. O’Malley MR, Haynes DS. Sudden hearing loss. *Otolaryngol Clin North Am*. 2008;41(3): 633-649, x-xi. **(Review)**
19. Ritenour AE, Wickley A, Ritenour JS, et al. Tympanic membrane perforation and hearing loss from blast overpressure in Operation Enduring Freedom and Operation Iraqi Freedom wounded. *J Trauma*. 2008;64(2 Suppl):S174-S178, discussion S178. **(Retrospective; 436 patients)**
20. Liess BD, Lollar KW, Christiansen SG, et al. Pulsatile tinnitus: a harbinger of a greater ill? *Head & Neck*. 2009;31(2):269-273. **(Case report)**
21. Agius AM, Pickles JM, Burch KL. A prospective study of otitis externa. *Clin Otolaryngol Allied Sci*. 1992;17(2):150-154. **(Prospective; 96 patients)**
22. Barriga F, Schwartz RH, Hayden GF. Adequate illumination for otoscopy. Variations due to power source, bulb, and head and speculum design. *Am J Dis Child*. 1986;140(12):1237-1240. **(Prospective study)**
23. Pelton SI. Otoscopy for the diagnosis of otitis media. *Pediatr Infect Dis J*. 1998;17(6):540-543, discussion 580. **(Review)**
24. Rosenfeld RM, Culpepper L, Doyle KJ, et al. Clinical practice guideline: Otitis media with effusion. *Otolaryngol Head Neck Surg*. 2004;130(5 Suppl):S95-S118. **(Guideline)**
25. Schulze SL, Kerschner J, Beste D. Pediatric external auditory canal foreign bodies: a review of 698 cases. *Otolaryngol Head Neck Surg*. 2002;127(1):73-78. **(Retrospective; 698 patients)**
- 26.* Rauch SD. Clinical practice. Idiopathic sudden sensorineural hearing loss. *N Engl J Med*. 2008;359(8):833-840. **(Review)**
27. Madani G, Connor SE. Imaging in pulsatile tinnitus. *Clin Radiol*. 2009;64(3):319-328. **(Review)**
- 28.* Waldvogel D, Mattle HP, Sturzenegger M, et al. Pulsatile tinnitus—a review of 84 patients. *J Neurology*. 1998;245(3):137-142. **(Retrospective; 84 patients)**
29. Krishnan A, Mattox DE, Fountain AJ, et al. CT arteriography and venography in pulsatile tinnitus: preliminary results. *Am J Neuroradiol*. 2006;27(8):1635-1638. **(Prospective; 16 patients)**
30. Mattox DE, Hudgins P. Algorithm for evaluation of pulsatile tinnitus. *Acta Otolaryngol*. 2008;128(4):427-431. **(Retrospective; 54 patients)**
31. Bertin L, Pons G, d’Athis P, et al. A randomized, double-blind, multicentre controlled trial of ibuprofen versus acetaminophen and placebo for symptoms of acute otitis media in children. *Fundam Clin Pharmacol*. 2009;10(4):387-392. **(Randomized, controlled; 219 patients)**
32. Bolt P, Barnett P, Babi FE, et al. Topical lignocaine for pain relief in acute otitis media: results of a double-blind placebo-

- controlled randomised trial. *Arch Dis Child*. 2008;93(1):40-44. **(Randomized, controlled; 63 patients)**
33. Foxlee R, Johansson A-C, Wejfalk J, et al. Topical analgesia for acute otitis media. *Cochrane Database Syst Rev*. 2006;3:CD005657. **(Systematic review)**
 - 34.* Spiro DM, Tay K, Arnold DH, et al. Wait-and-see prescription for the treatment of acute otitis media: a randomized controlled trial. *JAMA*. 2006;296(10):1235-1241. **(Randomized, controlled; 283 patients)**
 35. Marcy MS. Management of acute otitis media. *Evid Rep Technol Assess (Summ)*. 2000;(15):1-4. **(Meta-analysis)**
 - 36.* Thompson PL, Gilbert RE, Long PF, et al. Effect of antibiotics for otitis media on mastoiditis in children: a retrospective cohort study using the United Kingdom general practice research database. *Pediatrics*. 2009;123(2):424-430. **(Retrospective database; 2.6 million patients)**
 37. Cohen R, Levy C, Boucherat M, et al. Five vs. ten days of antibiotic therapy for acute otitis media in young children. *Pediatr Infect Dis J*. 2000;19(5):458-463. **(Randomized, controlled; 450 patients)**
 38. Cohen R, Levy C, Boucherat M, et al. A multicenter, randomized, double-blind trial of 5 versus 10 days of antibiotic therapy for acute otitis media in young children. *J Pediatr*. 1998;133(5):634-639. **(Randomized, controlled; 385 patients)**
 39. Pessey JJ, Gehanno P, Thoroddsen E, et al. Short course therapy with cefuroxime axetil for acute otitis media: results of a randomized multicenter comparison with amoxicillin/clavulanate. *Pediatr Infect Dis J*. 1999;18(10):854-859. **(Randomized, controlled; 716 patients)**
 40. Pichichero ME, Marsocci SM, Murphy ML, et al. A prospective observational study of 5-, 7-, and 10-day antibiotic treatment for acute otitis media. *Otolaryngol Head Neck Surg*. 2001;124(4):381-387. **(Randomized, controlled; 2172 patients)**
 41. Schmelzle J, Birtwhistle RV, Tan AK. Acute otitis media in children with tympanostomy tubes. *Can Fam Physician*. 2008;54(8):1123-1127. **(Review)**
 42. Sade J, Ar A, Fuchs C. Barotrauma vis-a-vis the "chronic otitis media syndrome": two conditions with middle ear gas deficiency. Is secretory otitis media a contraindication to air travel? *Ann Otol Rhinol Laryngol*. 2003;112(3):230-235. **(Prospective; 188 patients)**
 43. American Academy of Pediatrics, American Academy of Family Physicians, American Academy of Otolaryngology-Head and Neck Surgery, and American Academy of Pediatrics Subcommittee on Otitis Media With Effusion. Otitis media with effusion. *Pediatrics*. 2004;113:1412-1429. **(Guideline)**
 44. Cannon SJ, Grunwaldt E. Treatment of otitis externa with a tropical [sic] steroid-antibiotic combination. *Eye Ear Nose Throat Mon*. 1967;46(10):1296-1302. **(Prospective)**
 45. Cannon SJ. External otitis: controlled therapeutic trial. *Eye Ear Nose Throat Mon*. 1970;49(4):186-189. **(Prospective)**
 46. van Balen FA, Smit WM, Zuithoff NP, et al. Clinical efficacy of three common treatments in acute otitis externa in primary care: randomised controlled trial. *BMJ*. 2003;327(7425):1201-1205. **(Randomized, controlled; 213 patients)**
 47. Emgard P, Hellstrom S. A group III steroid solution without antibiotic components: an effective cure for external otitis. *J Laryngol Otol*. 2005;119(5):342-347. **(Randomized, controlled; 51 patients)**
 48. Halpern MT, Palmer CS, Seidlin M. Treatment patterns for otitis externa. *J Am Board Fam Pract*. 1999;12(1):1-7. **(Retrospective)**
 49. Goldstein NA, Casselbrant ML, Bluestone CD, et al. Intra-temporal complications of acute otitis media in infants and children. *Otolaryngol Head Neck Surg*. 1998;119(5):444-454. **(Retrospective; 72 patients)**
 50. Belleza WG, Kalman S. Otolaryngologic emergencies in the outpatient setting. *Med Clin North Am*. 2006;90(2):329-353. **(Review)**
 51. Kuhweide R, Van de Steene V, Vlaminck S, et al. Ramsay Hunt syndrome: pathophysiology of cochleovestibular symptoms. *J Laryngol Otol*. 2002;116(10):844-848. **(Review)**
 52. Sweeney CJ, Gilden DH. Ramsay Hunt syndrome. *J Neurol Neurosurg Psychiatry*. 2001;71(2):149-154. **(Review)**
 53. Jackson JL, Gibbons R, Meyer G, et al. The effect of treating herpes zoster with oral acyclovir in preventing postherpetic neuralgia. A meta-analysis. *Arch Intern Med*. 1997;157(8):909-912. **(Meta-analysis)**
 54. Wood MJ, Kay R, Dworkin RH, et al. Oral acyclovir therapy accelerates pain resolution in patients with herpes zoster: a meta-analysis of placebo-controlled trials. *Clin Infect Dis*. 1996;22(2):341-347. **(Meta-analysis)**
 55. Usategui T, Doree C, Chamberlain IJ, et al. Antiviral therapy for Ramsay Hunt syndrome (herpes zoster oticus with facial palsy) in adults. *Cochrane Database Syst Rev*. 2008;(4):CD006851. **(Systematic review)**
 56. Marin JR, Trainor JL. Foreign body removal from the external auditory canal in a pediatric emergency department. *Pediatr Emerg Care*. 2006;22(9):630-634. **(Retrospective; 254 patients)**
 57. Capo JM, Lucente FE. Alkaline battery foreign bodies of the ear and nose. *Arch Otolaryngol Head Neck Surg*. 1986;112(5):562-563. **(Case series; 2 patients)**
 58. Antonelli PJ, Ahmadi A, Prevatt A. Insecticidal activity of common reagents for insect foreign bodies of the ear. *Laryngoscope*. 2001;111(1):15-20. **(Prospective; 170 patients)**
 59. Scrivani SJ, Keith DA, Kaban LB. Temporomandibular disorders. *N Engl J Med*. 2008;359(25):2693-2705. **(Review)**
 60. Grant JR, Arganbright J, Friedland DR. Outcomes for conservative management of traumatic conductive hearing loss. *Otol Neurotol*. 2008;29(3):344-349. **(Retrospective; 45 patients)**
 - 61.* Burton MJ, Doree CJ. Ear drops for the removal of ear wax. *Cochrane Database Syst Rev*. 2003;(3):CD004400. **(Systematic review)**
 - 62.* Wei BP, Mubiru S, O'Leary S. Steroids for idiopathic sudden sensorineural hearing loss. *Cochrane Database Syst Rev*. 2006;(1):CD003998. **(Systematic review)**
 63. Conlin AE, Parnes LS. Treatment of sudden sensorineural hearing loss: II. A meta-analysis. *Arch Otolaryngol Head Neck Surg*. 2007;133(6):582-586. **(Meta-analysis)**
 64. Bennett MH, Kertesz T, Yeung P. Hyperbaric oxygen for idiopathic sudden sensorineural hearing loss and tinnitus. *Cochrane Database Syst Rev*. 2007;(1):CD004739. **(Systematic review)**
 65. Pelkonen O, Tikkakoski T, Luotonen J, et al. Pulsatile tinnitus as a symptom of cervicocephalic arterial dissection. *J Laryngol Otol*. 2004;118(3):193-198. **(Prospective; 136 patients)**
 66. Dobie RA. A review of randomized clinical trials in tinnitus. *Laryngoscope*. 1999;109(8):1202-1211. **(Review)**
 67. Murai K, Tyler RS, Harker LA, et al. Review of pharmacologic treatment of tinnitus. *Am J Otol*. 1992;13(5): 454-464. **(Review)**
 68. Johnson RM, Brummett R, Schleuning A. Use of alprazolam for relief of tinnitus. A double-blind study. *Arch Otolaryngol Head Neck Surg*. 1993;119(8):842-845. **(Randomized, controlled; 40 patients)**
 69. Dobie RA, Sakai CS, Sullivan MD, et al. Antidepressant treatment of tinnitus patients: report of a randomized clinical trial and clinical prediction of benefit. *Am J Otol*. 1993;14(1):18-23. **(Randomized, controlled; 92 patients)**
 70. Drew S, Davies E. Effectiveness of *Ginkgo biloba* in treating tinnitus: double blind, placebo controlled trial. *BMJ*. 2001;322(7278):73. **(Randomized, controlled; 1121 patients)**
 71. Baldo P, Doree C, Lazzarini R, et al. Antidepressants for patients with tinnitus. *Cochrane Database Syst Rev*. 2006;(4):CD003853. **(Systematic review)**
 72. Tan J, Tange RA, Dreschler WA, et al. Long-term effect of hyperbaric oxygenation treatment on chronic distressing tinnitus. *Scand Audiol*. 1999;28(2):91-96. **(Prospective; 20 patients)**

- 73.* Loumidis KS, Hallam RS, Cadge B. The effect of written reasuring information on out-patients complaining of tinnitus. *Br J Audiology*. 1991;25(2):105-109. **(Randomized, controlled)**
- 74.* Denkler K. A comprehensive review of epinephrine in the finger: to do or not to do. *Plast Reconstr Surg*. 2001;108(1):114-124. **(Review)**
75. Gessler EM, Hart AK, Dunlevy TM, et al. Optimal concentration of epinephrine for vasoconstriction in ear surgery. *Laryngoscope*. 2001;111(10):1687-1690. **(Randomized, controlled; 40 patients)**
76. Marx JA, Hockberger RS, Walls RM, eds. *Rosen's Emergency Medicine: Concepts and Clinical Practice*. 6th ed. Vol. 1. Philadelphia, Mosby, 2006, p. 3180. **(Textbook)**
77. Giles WC, Iverson KC, King JD, et al. Incision and drainage followed by mattress suture repair of auricular hematoma. *Laryngoscope*. 2007;117(12):2097-2099. **(Retrospective; 22 patients)**
78. Ghanem T, Rasamny JK, Park SS. Rethinking auricular trauma. *Laryngoscope*. 2005;115(7):1251-1255. **(Retrospective; 10 patients)**
79. Orji FT, Agu CC. Determinants of spontaneous healing in traumatic perforations of the tympanic membrane. *Clin Otolaryngol*. 2008;33(5):420-426. **(Prospective; 53 patients)**
- 80.* DePalma RG, Burris DG, Champion HR, et al. Blast injuries. *N Engl J Med*. 2005;352(13):1335-1342. **(Review)**
81. Leibovici D, Gofrit ON, Shapira SC. Eardrum perforation in explosion survivors: is it a marker of pulmonary blast injury? *Ann Emerg Med*. 1999;34(2):168-172. **(Prospective; 647 patients)**
82. Gutierrez de Ceballos JP, Turegano FF, Perez DD, et al. Casualties treated at the closest hospital in the Madrid, March 11, terrorist bombings. *Crit Care Med*. 2005;33(1):S107-S112. **(Retrospective; 312 patients)**
- 83.* Sugar NF, Taylor JA, Feldman KW. Bruises in infants and toddlers: those who don't bruise rarely bruise. Puget Sound Pediatric Research Network. *Arch Pediatr Adolesc Med*. 1999;153(4):399-403. **(Prospective; 973 patients)**
84. Carpenter RF. The prevalence and distribution of bruising in babies. *Arch Dis Child*. 1999;80(4):363-366. **(Prospective; 177 patients)**
85. Maguire S, Mann MK, Sibert J, et al. Are there patterns of bruising in childhood which are diagnostic or suggestive of abuse? A systematic review. *Arch Dis Child*. 2005;90(2):182-186. **(Systematic review)**
86. Feldman KW. Patterned abusive bruises of the buttocks and the pinnae. *Pediatrics*. 1992;90(4):633-636. **(Review)**
87. Hanigan WC, Peterson RA, Njus G. Tin ear syndrome: rotational acceleration in pediatric head injuries. *Pediatrics*. 1987;80(5):618-622. **(Case series; 3 patients)**
88. American Academy of Pediatrics. Diagnostic imaging of child abuse. *Pediatrics*. 2000;105(6):1345-1348. **(Guideline)**
89. Vlastarakos PV, Nikolopoulous L, Ferekidis E, et al. Treating common ear problems in pregnancy: what is safe? *Eur Arch Otorhinolaryngol*. 2008;265(2):139-145. **(Review)**
90. Lawrence CG, Nadel ES, Silvers SM, et al. Acute change in mental status. *J Emerg Med*. 2001;21(2):179-182. **(Case report)**
91. O'Brien MA, Prosser LA, Paradise JL, et al. New vaccines against otitis media: projected benefits and cost-effectiveness. *Pediatrics*. 2009;123(6):1452-1463. **(Model)**

CME Questions



Take This Test Online!

Current subscribers receive CME credit absolutely free by completing the following test. Monthly online testing is now available for current and archived issues. Visit <http://www.ebmedicine.net/CME>

today to receive your free CME credits. Each issue includes 4 AMA PRA Category 1 Credits™, 4 ACEP Category 1 credits, 4 AAFP Prescribed credits, and 4 AOA Category 2B credits.

- Which of the following may present with pain referred to the ear?
 - Dental abscess
 - Pharyngitis
 - Tonsillitis
 - TMJ disorders
 - All of the above
- Which of the following is a possible cause of tinnitus?
 - Aspirin toxicity
 - Carotid artery dissection
 - Palatal myoclonus
 - TMJ dysfunction
 - All of the above
- Which of the following is necessary (but not sufficient) for diagnosis of AOM?
 - Dizziness
 - Ear proptosis
 - Erythema of external auditory canal
 - Gradual onset of ear pain
 - Middle ear effusion
- Which of the following findings demonstrates sensorineural hearing loss in the left ear?
 - Decreased hearing in right ear, patient's humming is perceived louder in left ear
 - Decreased hearing in right ear, patient's humming is perceived louder in right ear
 - Decreased hearing in left ear, patient's humming is perceived louder in left ear
 - Decreased hearing in left ear, patient's humming is perceived louder in right ear
 - Equal hearing in both ears, patient's humming is perceived louder in right ear
- How is AOM with effusion in a healthy 6-year-old child best managed in the ED?
 - Discharge home with follow-up by primary care provider
 - High-dose amoxicillin
 - Otolaryngology consultation
 - Topical antibiotics
 - Tympanocentesis
- Which of the following patients does NOT need systemic antibiotics for OE?
 - 6-year-old male with leukemia
 - 6-year-old male with tympanostomy tubes
 - 12-year-old female with asthma
 - 65-year-old female with AIDS
 - 65-year-old male with poorly controlled diabetes

7. Emergent consultation with an otolaryngologist is necessary in which of the following diagnoses?
- Conductive hearing loss
 - Gradual hearing loss
 - Mastoiditis
 - OE
 - OM
8. Which of the following is NOT an acceptable method of retrieving a foreign body from the ear?
- Alligator forceps under direct visualization
 - Blind grasping with forceps
 - Passing a right-angled hook past the object
 - Suction
 - Warm-water irrigation
9. Which of the following is more efficacious than the others in treating cerumen impaction?
- Triethanolamine polypeptide
 - Sterile water
 - Sodium bicarbonate
 - None of the above
10. After ruling out more life-threatening etiologies, the most appropriate therapy for tinnitus in the ED is:
- Ginkgo biloba*
 - Imipramine
 - Lorazepam
 - Propranolol
 - Reassurance and outpatient otolaryngology follow-up
11. In a 4-month-old with bruises on the ear and whose parents report an unwitnessed injury, child abuse should be suspected.
- True
 - False

Physician CME Information

Date of Original Release: July 1, 2010. Date of most recent review: April 15, 2010.

Termination date: July 1, 2013.

Accreditation: EB Medicine is accredited by the ACCME to provide continuing medical education for physicians.

Credit Designation: EB Medicine designates this educational activity for a maximum of 48 AMA PRA Category 1 Credits™ per year. Physicians should only claim credit commensurate with the extent of their participation in the activity.

ACEP Accreditation: *Emergency Medicine Practice* is approved by the American College of Emergency Physicians for 48 hours of ACEP Category 1 credit per annual subscription.

AAFP Accreditation: *Emergency Medicine Practice* has been reviewed and is acceptable for up to 48 Prescribed credits per year by the American Academy of Family Physicians. AAFP Accreditation begins August 1, 2009. Term of approval is for 1 year from this date. Each issue is approved for 4 Prescribed credits. Credits may be claimed for 1 year from the date of this issue.

AOA Accreditation: *Emergency Medicine Practice* has been approved for 48 Category 2B credit hours per year by the American Osteopathic Association.

Needs Assessment: The need for this educational activity was determined by a survey of medical staff, including the editorial board of this publication; review of morbidity and mortality data from the CDC, AHA, NCHS, and ACEP; and evaluation of prior activities for emergency physicians.

Target Audience: This enduring material is designed for emergency medicine physicians, physician assistants, nurse practitioners, and residents.

Goals & Objectives: Upon completion of this article, you should be able to: (1) demonstrate medical decision-making based on the strongest clinical evidence; (2) cost-effectively diagnose and treat the most critical ED presentations; and (3) describe the most common medicolegal pitfalls for each topic covered.

Discussion of Investigational Information: As part of the newsletter, faculty may be presenting investigational information about pharmaceutical products that is outside Food and Drug Administration-approved labeling. Information presented as part of this activity is intended solely as continuing medical education and is not intended to promote off-label use of any pharmaceutical product.

Faculty Disclosure: It is the policy of EB Medicine to ensure objectivity, balance, independence, transparency, and scientific rigor in all CME-sponsored educational activities. All faculty participating in the planning or implementation of a sponsored activity are expected to disclose to the audience any relevant financial relationships and to assist in resolving any conflict of interest that may arise from the relationship.

In compliance with all ACCME Essentials, Standards, and Guidelines, all faculty for this CME activity were asked to complete a full disclosure statement. The information received is as follows: **Dr. Siegelman, Dr. Kazda, Dr. Lindberg, Dr. Bessette, Dr. Hahn, and their related parties report no significant financial interest or other relationship with the manufacturer(s) of any commercial product(s) discussed in this educational presentation.**

Method of Participation:

- Print Semester Program:** Paid subscribers who read all CME articles during each *Emergency Medicine Practice* 6-month testing period, complete the post-test and the CME Evaluation Form distributed with the June and December issues, and return it according to the published instructions are eligible for up to 4 hours of CME credit for each issue. You must complete both the post-test and CME Evaluation Form to receive credit. Results will be kept confidential.

- Online Single-Issue Program:** Current, paid subscribers who read this *Emergency Medicine Practice* CME article and complete the online post-test and CME Evaluation Form at www.ebmedicine.net are eligible for up to 4 hours of Category 1 credit toward the AMA Physician's Recognition Award (PRA). You must complete both the post-test and CME Evaluation Form to receive credit. Results will be kept confidential. CME certificates may be printed directly from the website.

Hardware/Software Requirements: You will need a Macintosh or PC to access the online archived articles and CME testing. Adobe Reader is required to view the PDFs of the archived articles. Adobe Reader is available as a free download at www.adobe.com.

Additional Policies: For additional policies, including our statement of conflict of interest, source of funding, statement of informed consent, and statement of human and animal rights, visit <http://www.ebmedicine.net/policies>.

CEO: Robert Williford **President and Publisher:** Stephanie Ivy **Associate Editor:** Dorothy Whisenhunt **Associate Editor and CME Director:** Jennifer Pai **Director of Member Services:** Liz Alvarez **Marketing & Customer Service Coordinator:** Robin Williford

Direct all questions to:

EB Medicine

1-800-249-5770 or 1-678-366-7933

Fax: 1-770-500-1316

5550 Triangle Parkway, Suite 150

Norcross, GA 30092

E-mail: ebm@ebmedicine.net

Website: www.ebmedicine.net

To write a letter to the editor, please email: jagodamd@ebmedicine.net

Subscription Information:

48 AMA PRA Category 1 Credits™, 48 ACEP Category 1 credits, 48 AAFP Prescribed credits, and 48 AOA Category 2B CME credits, and full online access to searchable archives and additional CME: \$329

Individual issues, including 4 CME credits: \$30

(Call 1-800-249-5770 or go to

<http://www.ebmedicine.net/EMP> issues to order)

Emergency Medicine Practice (ISSN Print: 1524-1971, ISSN Online: 1559-3908) is published monthly (12 times per year) by EB Practice, LLC, d.b.a. EB Medicine (5550 Triangle Parkway, Suite 150, Norcross, GA 30092). Opinions expressed are not necessarily those of this publication. Mention of products or services does not constitute endorsement. This publication is intended as a general guide and is intended to supplement, rather than substitute, professional judgment. It covers a highly technical and complex subject and should not be used for making specific medical decisions. The materials contained herein are not intended to establish policy, procedure, or standard of care. *Emergency Medicine Practice* is a trademark of EB Practice, LLC. Copyright © 2010 EB Practice, LLC, d.b.a. EB Medicine. All rights reserved. No part of this publication may be reproduced in any format without written consent of EB Practice, LLC. This publication is intended for the use of the individual subscriber only and may not be copied in whole or part or redistributed in any way without the publisher's prior written permission — including reproduction for educational purposes or for internal distribution within a hospital, library, group practice, or other entity.

EVIDENCE-BASED PRACTICE RECOMMENDATIONS

Evaluation And Treatment Of Common Ear Complaints In The Emergency Department

Siegelman J, Kazda G, Lindberg D. July 2010, Volume 12; Number 7

This issue of Emergency Medicine Practice covers 4 common complaints involving the ear: pain (otalgia), hearing loss, tinnitus, and trauma. For a more detailed discussion of this topic, including figures and tables, clinical pathways, and other considerations not noted here, please see the complete issue on the EB Medicine website at www.ebmedicine.net/topics.

Key Points	Comments
Otitis media does not always require antibiotics, and can often be safely treated with a “wait-and-see” prescription in well appearing children with reliable follow-up.	Use of this strategy in healthy children between 6 months and 2 years of age is limited to those with non-severe illness (fever < 39°C [102.2°F] and mild otalgia) and an uncertain diagnosis. In children older than 2 years, it is limited to those without severe symptoms at presentation or those with an uncertain diagnosis. The observation strategy has not been shown to be associated with any significant increase in risk of meningitis or mastoiditis, though studies have not included enough patients to reliably exclude a small increase in these rare outcomes. ^{32,33}
Proper aural toilet should be performed in treating otitis externa to ensure that topical antibiotics are delivered properly.	A systematic review of 18 trials revealed no difference in the clinical outcome between treatment with an antiseptic (such as acetic acid) versus antibacterial (such as an aminoglycoside), or between steroid plus antimicrobial and antimicrobial alone, though it did show benefit of antimicrobial plus steroid over steroid alone. ^{4,44} Steroids do seem to reduce duration of pain and itching. ⁴⁵
Malignant otitis externa can be devastating; be on the lookout for this in diabetics and immunocompromised patients.	Emergent ENT consultation should be obtained for confirmation and further evaluation, which may include CT imaging.
Hearing loss is a rare complaint in the ED. Conductive loss caused by foreign body or cerumen can often be treated immediately whereas most causes of sensorineural hearing loss will be best evaluated as an outpatient by ENT.	Multiple agents have been tried in the treatment of idiopathic sudden sensorineural hearing loss, but clear evidence showing benefit for any of them is lacking. A Cochrane review on steroids found only 2 trials, with conflicting results. ⁶¹ Multiple reviews do still recommend a 10-14 day taper of prednisone beginning at 60 mg, with few other treatment options available. ²⁴
Auricular hematomas must be incised and drained to avoid infection and deformity.	Simple needle aspiration of the hematoma is often cited as the initial recommended treatment, though it often fails, occurring in 75% of cases in one study. ⁷⁶ One explanation for failures, described in a retrospective review of 10 patients who failed at least 1 attempt at needle aspiration, is that in some patients the hematoma forms within the cartilage itself, as opposed to the subperichondrial space. ⁷⁷

See reverse side for reference citations.

REFERENCES

These references are excerpted from the original manuscript. For additional references and information on this topic, see the full text article at ebmedicine.net.

4. Rosenfeld RM, Brown L, Cannon CR, et al. Clinical practice guideline: acute otitis externa. *J Am Acad Otolaryngol Head Neck Surg*. 2006;134(4 Suppl):S4-S23. **(Retrospective; 119.2 million patients)**
24. Rosenfeld RM, Culpepper L, Doyle KJ, et al. Clinical practice guideline: otitis media with effusion. *Otolaryngol Head Neck Surg*. 2004;130(5 Suppl):S95-S118. **(Guideline)**
32. Bolt P, Barnett P, Babi FE, et al. Topical lignocaine for pain relief in acute otitis media: results of a double-blind placebo-controlled randomised trial. *Arch Dis Child*. 2008;93(1):40-44. **(Randomized, controlled; 63 patients)**
33. Foxlee R, Johansson A-C, Wejfalk J, et al. Topical analgesia for acute otitis media. *Cochrane Database Syst Rev*. 2006;3:CD005657. **(Systematic review)**
44. Cannon SJ, Grunwaldt E. Treatment of otitis externa with a topical [sic] steroid-antibiotic combination. *Eye Ear Nose Throat Mon*. 1967;46(10):1296-1302. **(Prospective)**
45. Cannon SJ. External otitis: controlled therapeutic trial. *Eye Ear Nose Throat Mon*. 1970;49(4):186-189. **(Prospective)**
61. Burton MJ, Doree CJ. Ear drops for the removal of ear wax. *Cochrane Database Syst Rev*. 2003;(3):CD004400. **(Systematic review)**
76. Marx JA, Hockberger RS, Walls RM, eds. *Rosen's Emergency Medicine: Concepts and Clinical Practice*. 6th ed. Vol. 1. Philadelphia, Mosby, 2006, p. 3180. **(Textbook)**
77. Giles WC, Iverson KC, King JD, et al. Incision and drainage followed by mattress suture repair of auricular hematoma. *Laryngoscope*. 2007;117(12):2097-2099. **(Retrospective; 22 patients)**

CLINICAL RECOMMENDATIONS

Designed for use in every-day practice

Use The Evidence-Based Practice Recommendations On The Reverse Side For:

- Discussions with colleagues
- Developing hospital guidelines
- Posting on your bulletin board
- Preparing for the boards
- Storing in your hospital's library
- Teaching residents and medical students

Emergency Medicine Practice subscribers: Are you taking advantage of all your subscription benefits? Visit your free online account at www.ebmedicine.net to search archives, browse clinical resources, take free CME tests, and more.

Not a subscriber to Emergency Medicine Practice? As a subscriber, you'll benefit from evidence-based, clinically relevant, eminently usable diagnostic and treatment recommendations for everyday practice. Plus, you'll receive up to 192 *AMA PRA Category 1 CreditsTM*; 192 ACEP Category 1 credits; 192 AAFP Prescribed credits; and 192 AOA category 2B CME credits and full online access to our one-of-a-kind online database. Visit www.ebmedicine.net/subscribe or call 1-800-249-5770 to learn more today.

Questions, comments, suggestions?

To write a letter to the editor, email: JagodaMD@ebmedicine.net

For all other questions, contact EB Medicine:

Phone: 1-800-249-5770 or 678-366-7933

Fax: 1-770-500-1316

Address: 5550 Triangle Parkway, Suite 150 / Norcross, GA 30092