

condition, however, is poorly understood. Although certain conditions (e.g., cystic fibrosis) can predispose patients to chronic bacterial sinusitis, most patients with chronic rhinosinusitis do not have obvious underlying conditions that result in the obstruction of sinus drainage, the impairment of ciliary action, or immune dysfunction. Patients experience constant nasal congestion and sinus pressure, with intermittent periods of greater severity, which may persist for years. CT can be helpful in determining the extent of disease, detecting an underlying anatomic defect or obstructing process (e.g., a polyp), and assessing the response to therapy. Management should involve an otolaryngologist to conduct endoscopic examinations and obtain tissue samples for histologic examination and culture. An endoscopy-derived culture not only has a higher yield but also allows direct visualization for abnormal anatomy.

Chronic fungal sinusitis is a disease of immunocompetent hosts and is usually noninvasive, although slowly progressive invasive disease is sometimes seen. Noninvasive disease, which typically is associated with hyaline molds such as *Aspergillus* species and dematiaceous molds such as *Curvularia* or *Bipolaris* species, can present as a number of different scenarios. In mild, indolent disease, which usually occurs in the setting of repeated failures of antibacterial therapy, only nonspecific mucosal changes may be seen on sinus CT. Although there is some controversy on this point, endoscopic surgery is usually curative in these cases, with no need for antifungal therapy. Another form of disease presents as long-standing, often unilateral symptoms and opacification of a single sinus on imaging studies as a result of a mycetoma (fungus ball) within the sinus. Treatment for this condition also is surgical, although systemic antifungal therapy may be warranted in the rare case in which bony erosion occurs. A third form of disease, known as *allergic fungal sinusitis*, is seen in patients with a history of nasal polyposis and asthma, who often have had multiple sinus surgeries. Patients with this condition produce a thick, eosinophil-laden mucus with the consistency of peanut butter that contains sparse fungal hyphae on histologic examination. These patients often present with pansinusitis.

TREATMENT CHRONIC SINUSITIS

Treatment of chronic bacterial sinusitis can be challenging and consists primarily of repeated culture-guided courses of antibiotics, sometimes for 3–4 weeks or longer at a time; administration of intranasal glucocorticoids; and mechanical irrigation of the sinus with sterile saline solution. When this management approach fails, sinus surgery may be indicated and sometimes provides significant, albeit short-term, alleviation. Treatment of chronic fungal sinusitis consists of surgical removal of impacted mucus. Recurrence, unfortunately, is common.

INFECTIONS OF THE EAR AND MASTOID

Infections of the ear and associated structures can involve both the middle and the external ear, including the skin, cartilage, periosteum, ear canal, and tympanic and mastoid cavities. Both viruses and bacteria are known causes of these infections, some of which result in significant morbidity if not treated appropriately.

INFECTIONS OF EXTERNAL EAR STRUCTURES

Infections involving the structures of the external ear are often difficult to differentiate from noninfectious inflammatory conditions with similar clinical manifestations. Clinicians should consider inflammatory disorders as possible causes of external ear irritation, particularly in the absence of local or regional adenopathy. Aside from the more salient causes of inflammation, such as trauma, insect bite, and overexposure to sunlight or extreme cold, the differential diagnosis should include less common conditions such as autoimmune disorders (e.g., lupus or relapsing polychondritis) and vasculitides (e.g., granulomatosis with polyangiitis).

Auricular Cellulitis Auricular cellulitis is an infection of the skin overlying the external ear and typically follows minor local trauma. It

presents as the typical signs and symptoms of cellulitis, with tenderness, erythema, swelling, and warmth of the external ear (particularly the lobule) but without apparent involvement of the ear canal or inner structures. Treatment consists of warm compresses and oral antibiotics such as cephalexin or dicloxacillin that are active against typical skin and soft tissue pathogens (specifically, *S. aureus* and streptococci). IV antibiotics such as a first-generation cephalosporin (e.g., cefazolin) or a penicillinase-resistant penicillin (e.g., nafcillin) occasionally are needed for more severe cases, with consideration of MRSA if either risk factors or failure of therapy point to this organism.

Perichondritis Perichondritis, an infection of the perichondrium of the auricular cartilage, typically follows local trauma (e.g., piercings, burns, or lacerations). Occasionally, when the infection spreads down to the cartilage of the pinna itself, patients may develop chondritis. The infection may closely resemble auricular cellulitis, with erythema, swelling, and extreme tenderness of the pinna, although the lobule is less often involved in perichondritis. The most common pathogens are *P. aeruginosa* and *S. aureus*, although other gram-negative and gram-positive organisms occasionally are involved. Treatment consists of systemic antibiotics active against both *P. aeruginosa* and *S. aureus*. An antipseudomonal penicillin (e.g., piperacillin) or a combination of a penicillinase-resistant penicillin and an antipseudomonal quinolone (e.g., nafcillin plus ciprofloxacin) is typically used. Incision and drainage may be helpful for culture and for resolution of infection, which often takes weeks. When perichondritis fails to respond to adequate antimicrobial therapy, clinicians should consider a noninfectious inflammatory etiology such as relapsing polychondritis.

Otitis Externa The term *otitis externa* refers to a collection of diseases involving primarily the auditory meatus. Otitis externa usually results from a combination of heat and retained moisture, with desquamation and maceration of the epithelium of the outer ear canal. The disease exists in several forms: localized, diffuse, chronic, and invasive. All forms are predominantly bacterial in origin, with *P. aeruginosa* and *S. aureus* the most common pathogens.

Acute localized otitis externa (furunculosis) can develop in the outer third of the ear canal, where skin overlies cartilage and hair follicles are numerous. As in furunculosis elsewhere on the body, *S. aureus* is the usual pathogen, and treatment typically consists of an oral antistaphylococcal penicillin (e.g., dicloxacillin or cephalexin), with incision and drainage in cases of abscess formation.

Acute diffuse otitis externa is also known as *swimmer's ear*, although it can develop in patients who have not recently been swimming. Heat, humidity, and the loss of protective cerumen lead to excessive moisture and elevation of the pH in the ear canal, which in turn lead to skin maceration and irritation. Infection may then follow; the predominant pathogen is *P. aeruginosa*, although other gram-negative and gram-positive organisms—and rarely yeasts—have been recovered from patients with this condition. The illness often starts with itching and progresses to severe pain, which is usually elicited by manipulation of the pinna or tragus. The onset of pain is generally accompanied by the development of an erythematous, swollen ear canal, often with scant white, clumpy discharge. Treatment consists of cleansing the canal to remove debris and enhance the activity of topical therapeutic agents—usually hypertonic saline or mixtures of alcohol and acetic acid. Inflammation can also be decreased by adding glucocorticoids to the treatment regimen or by using Burow's solution (aluminum acetate in water). Antibiotics are most effective when given topically. Otic mixtures provide adequate pathogen coverage; these preparations usually combine neomycin with polymyxin, with or without glucocorticoids. Systemic antimicrobial agents typically are reserved for severe disease or infections in immunocompromised hosts.

Chronic otitis externa is caused primarily by repeated local irritation, most commonly arising from persistent drainage from a chronic middle-ear infection. Other causes of repeated irritation, such as insertion of cotton swabs or other foreign objects into the ear canal, can lead to this condition, as can rare chronic infections such as syphilis, tuberculosis, and leprosy. Chronic otitis externa typically presents as erythematous, scaling dermatitis in which the predominant symptom