External otitis: Pathogenesis, clinical features, and diagnosis

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INTRODUCTION

The term external otitis (also known as otitis externa or swimmer's ear) refers to inflammation of the external auditory canal. Infectious, allergic, and dermatologic disease may all lead to external otitis. Acute bacterial infection is the most common cause of external otitis [1].

This topic will focus on the pathogenesis, clinical features, and diagnosis of external otitis. The treatment of external otitis is discussed in detail elsewhere. (See "External otitis in adults: Treatment".)

EPIDEMIOLOGY

External otitis can occur in all age groups [2]. An estimated 10 percent of people develop external otitis during their lifetime. Annual rates of ambulatory care visits in the United States for external otitis are highest during childhood and decrease with age [3]:

- 7 percent ages 0 to 4 years
- 19 percent ages 5 to 9 years
- 16 percent ages 10 to 14 years
- 9 percent ages 15 to 19 years

- 5 percent ages ≥20 years

External otitis is more likely to occur in the summer, compared with winter months [2]. This may be related to increased ambient humidity and participation in outdoor water activities.

ANATOMY

The external auditory canal is a cylinder measuring approximately 2.5 cm in length and 7.0 to 9.0 mm in width, extending from the conchal cartilage of the auricle to the tympanic membrane (figure 1). It is divided into a lateral (outer) cartilaginous portion that occupies approximately one-third of the canal and a medial (inner) bony portion that occupies the remaining two-thirds. Their junction is termed the isthmus and is the narrowest region of the ear canal. The outer cartilaginous portion is lined by thicker skin with numerous adnexal structures including cerumen glands, sebaceous glands, and hair follicles. The inner bony portion of the canal contains thin skin without subcutaneous tissue. The dermis in this area is in direct contact with the underlying periosteum. Thus, minimal inflammation or instrumentation of the bony canal causes significant pain and/or injury.

The inferior tympanic recess is a small depression in the inferior medial aspect of the ear canal, adjacent to the tympanic membrane. Debris can collect in this area and cause or perpetuate infection.

The lining of the ear canal is a keratinizing squamous epithelium that undergoes continual sloughing. Epithelial migration is a naturally occurring cleaning process for the ear canal that allows egress of keratin debris and cerumen. Epithelial migration begins in the center of the tympanic membrane and continues out to the medial, then lateral aspects of the ear canal.

The ear canal is bound superiorly by the middle cranial fossa, anteriorly by the temporomandibular joint and parotid region, medially by the tympanic membrane, posteriorly by the mastoid cavity, and inferiorly by the skull base and soft tissues of the neck. These boundaries have particular importance when considering the potential complications of external otitis.

The fissures of Santorini are a series of embryologic fissures in the anterior aspect of the cartilaginous portion of the canal through which neurovascular tissues pass. These fissures also allow potential spread of ear canal disease to the parotid region, temporomandibular joint, and soft tissue of the upper neck.

PATHOGENESIS AND RISK FACTORS

Several factors may contribute to the development of external otitis, despite the defense mechanisms of the auditory canal.

The inherent defense mechanisms of the ear canal include:

- The tragus and conchal cartilage partially cover the opening of the ear canal and help to prevent foreign body entrance.
- Hair follicles and the isthmus narrowing inhibit entry of contaminants into the ear canal.
- Cerumen helps create an acidic ear canal environment, which inhibits bacterial and fungal growth. It is also hydrophobic, repelling water that might otherwise create an ideal culture medium. In addition, the sticky quality of cerumen helps to trap fine debris.

Breakdown of the skin-cerumen barrier is the first step in the pathogenesis of external otitis. Inflammation and edema of the skin then leads to pruritus and obstruction. The pruritus prompts scratching that may create further injury. This sequence of events alters the quality and amount of cerumen produced, impairs epithelial migration, and increases the pH of the ear canal. The resulting dark, warm, alkaline, moist ear canal becomes an ideal breeding ground for numerous organisms.

Specific factors increase the risk of external otitis [4-7]:

- Swimming or other water exposure is a well-documented risk factor for external otitis. Excess moisture leads to skin maceration and breakdown of the skin-cerumen barrier, changing the microflora of the ear canal to predominantly gram-negative bacteria. (See 'Microbiology' below.)
- Any trauma such as from excessive cleaning or aggressive scratching of the ear canal not only removes cerumen but can also create abrasions along the thin layer of skin in the ear canal, allowing organisms to gain access to deeper tissue. In addition, part of a cotton swab may become detached or a small piece of tissue paper may be left behind in the ear canal; these remnants can partially disintegrate and fester, causing a severe skin reaction and infection.
- Devices that occlude the ear canal such as hearing aids, earphones, or diving caps can predispose to external otitis.

- Allergic contact dermatitis can lead to external otitis (eg, from earrings or chemicals in cosmetics or shampoos).
- Dermatologic conditions can also predispose to external otitis (eg, psoriasis, atopic dermatitis).
- Prior radiation therapy can cause ischemic ear canal changes, alter cerumen production and epithelial migration, and predispose to external otitis.

MICROBIOLOGY

The most common pathogenic organisms responsible for external otitis are *Pseudomonas aeruginosa* (41 percent) and *Staphylococcus aureus* (15 percent) (table 1). However, there are several other gram-positive and -negative bacteria that can also cause external otitis. Anaerobic pathogens are present in 17 percent of patients; bacteroides and peptostreptococci are the most frequently encountered anaerobic organisms [5,8-10]. Some patients may have mixed aerobic and anaerobic infection.

Fungal infection accounts for 2 to 10 percent of cases of external otitis and most frequently occurs after treatment of bacterial infection. Candidal infection occurs more commonly in patients who use hearing aids [11]. Polymicrobial disease occurs in up to one-third of cases [8,9]. (See 'Otomycosis' below.)

CLINICAL FEATURES

The most common symptoms of external otitis are ear pain, pruritus, discharge, and hearing loss [2]. In addition to symptoms, patients should be asked about any known tympanic membrane perforation, previous ear infections, any prior ear surgery or radiation, chronic skin conditions, recent ear instrumentation, use of devices in the ear canal, and water exposure.

On physical examination, the auricle and tragus should be examined for erythema or signs of trauma (figure 1). Tenderness with tragal pressure or when the auricle is manipulated or pulled are indicative findings of external otitis. However, these signs may be absent in mild cases.

Otoscopy is critical for distinguishing between external otitis, otitis media, and other ear pathology. The ear canal usually appears edematous and erythematous in external otitis. Debris or cerumen is typically yellow, brown, white, or gray. Otomycosis, a fungal infection of the

external canal, may take on different appearances (eg, fine, dark coating with *Aspergillus*; white, sebaceous-like material with *Candida*) (see 'Otomycosis' below). The tympanic membrane may be erythematous in external otitis and only partially visible due to canal edema. The presence of an air-fluid level along the tympanic membrane is indicative of a middle ear effusion and underlying otitis media (picture 1).

The examination is aided with a pneumatic otoscope that allows for insufflation (picture 2). The tympanic membrane in patients with external otitis should be mobile with pneumatic insufflation. With gentle application of positive then negative pressure by the pneumatic otoscope, the normal tympanic membrane moves inwards then outwards, respectively (movie 1). The movement of the tympanic membrane is most evident posterosuperiorly. A fluid-filled middle ear will minimize any tympanic membrane excursions with insufflation (movie 2). There should be no evidence of middle ear fluid in isolated external otitis. (See "Acute otitis media in adults", section on 'Presentation and diagnosis' and "Acute otitis media in children: Clinical manifestations and diagnosis", section on 'Otoscopic evaluation'.)

The diagnosis of external otitis should also be questioned when the patient has a perforated tympanic membrane. It is likely that the primary focus of disease in these patients is the middle ear, with secondary inflammation of the ear canal. (See "Evaluation and management of middle ear trauma" and "Acute otitis media in adults", section on 'Management of acute tympanic membrane rupture in acute otitis media' and "Evaluation of earache in children", section on 'Blunt or penetrating trauma'.)

The patient should be evaluated for findings that might indicate malignant external otitis. Granulation tissue at the bony cartilaginous junction of the ear canal floor is a classic finding. Frank necrosis of ear canal skin may be evident. (See 'Malignant external otitis' below.)

Severity — The spectrum of external otitis ranges from mild to severe, based upon the presenting symptoms and physical examination [7].

- Mild disease is characterized by minor discomfort and pruritus (picture 3). There is minimal canal edema.
- Moderate disease is characterized by an intermediate degree of pain and pruritus. The canal is partially occluded (picture 4).
- Severe disease is characterized by intense pain, and the canal is completely occluded from edema. There is usually periauricular erythema, lymphadenopathy, and fever (picture 5).

DIAGNOSIS

The diagnosis of external otitis is clinical, based upon a characteristic history and physical examination. (See 'Clinical features' above.)

Guidelines from the American Academy of Otolaryngology-Head and Neck Surgery define diffuse acute otitis externa as occurring with rapid onset (generally within 48 hours) in the previous three weeks with signs and symptoms of ear canal inflammation (tender tragus and/or pinna), or diffuse edema or erythema of the ear canal, with or without otorrhea, regional adenopathy, erythema of the tympanic membrane, or cellulitis of the pinna and adjacent skin [12].

Cultures — Cultures are generally reserved for patients with severe cases of external otitis. Performing culture is usually more costly than simply starting empiric treatment, which is usually very effective. Thus, patients with mild and moderate external otitis do not need culture of the ear canal prior to starting therapy. However, cultures should be performed in those with severe external otitis, recurrent external otitis, chronic otitis externa, immunosuppressed patients (eg, posttransplant, HIV, receiving chemotherapy or radiation therapy), infections in patients after ear surgery, and patients who do not respond to initial therapy [13]. Culture is performed using a small cotton swab within the external canal.

DIFFERENTIAL DIAGNOSIS

A number of disorders can mimic acute bacterial external otitis.

Otomycosis — Otomycosis is a fungal infection of the external auditory canal. Otomycosis can occur as the primary infection or can develop along with bacterial external otitis, usually as a result of antibiotic therapy. Fungal infections are responsible for approximately 9 percent of ear canal infections [14]. *Aspergillus niger* and *Candida* are the most common organisms, although the dominant organism varies according to geographic location. The incidence of otomycosis is higher in tropical and subtropical locations, probably because of the humidity [15]. Swimming and ear canal scratching or cleaning also predispose to otomycosis. Concern has been raised that excessive use of antibiotic ear drops might allow fungal proliferation. However, the incidence and types of fungal infections have not changed significantly despite several decades of topical antibiotic use.

Patients with otomycosis most commonly report ear itching, discomfort, discharge, and/or a feeling that something is in the ear canal [16]. Deep-seated itching is the most troublesome

symptom; pain is less intense than with bacterial external otitis.

Fungal infections are often located in the medial aspect of the ear canal. This may be due in part to the location of the inferior tympanic recess (figure 1), which facilitates accumulation of debris in this area. In addition, the medial aspect of the ear canal is darker and warmer, features that promote fungal growth.

Edema of the ear canal is less severe than with bacterial external otitis. Fungal organisms have a very characteristic appearance in the ear canal, especially under magnified vision (picture 6). Fine fungal filaments and spores may be seen that resemble mold growing on spoiled food. *A. niger* spores look like a fine coal dust sprinkled in the ear canal. Aspergillus may also resemble wet newspaper or blotting paper. Candidal infections typically are associated with soft, white, sebaceous-like material that may fill the ear canal in severe cases. A pseudomembrane often lines the ear canal that, when removed, reveals an underlying friable granular membrane.

The treatment of otomycosis is discussed elsewhere. (See "External otitis in adults: Treatment", section on 'Otomycosis'.)

Contact dermatitis — Patients with persistent edema and erythema of the ear canal and auricle despite appropriate external otitis treatment may be experiencing an allergic reaction. Contact dermatitis can be commonly caused by ototopical medication, cosmetics, or shampoos. These are Gell and Coombs type IV delayed hypersensitivity reactions; secondary exposure to the allergen initiates an inflammatory response.

Contact dermatitis should be considered if there has been a lack of response to external otitis treatment over a one-week period. Pruritus is the dominant symptom. Erythema intensifies and classically extends to the inferior aspect of the conchal cartilage where drops often collect after application (picture 7). Vesicles may be seen, and there are often extensive secondary changes from rubbing and itching.

Common ototopical agents causing allergic reactions are neomycin, benzocaine, and propylene glycol [17,18]:

- Neomycin allergy occurs in 35 percent of chronically treated patients [19]. Cross-reactivity among other aminoglycosides, including tobramycin and gentamicin, is common.
- Benzocaine is the topical anesthetic present in many topical anesthetic otic solutions. Benzocaine is an allergic sensitizer, particularly in the presence of skin breakdown. It is no longer available in the United States. Pain from external otitis should be managed with

oral nonsteroidal antiinflammatory agents or acetaminophen to avoid sensitization by topical anesthetics. (See "Allergic reactions to local anesthetics", section on 'Rare: Delayed reactions (contact dermatitis or local swelling)'.)

- Propylene glycol is a common solvent and preservative in ototopical agents. It can act as a primary irritant or an allergic sensitizer.

If the causative agent is not readily apparent by history alone, patch testing can help identify the allergen.

The treatment of contact dermatitis of the ear canal is discussed elsewhere. (See "External otitis in adults: Treatment", section on 'Contact dermatitis'.)

Chronic suppurative otitis media — Patients with chronic suppurative otitis media (CSOM) may also present with a draining ear and can be mistakenly thought to have external otitis. CSOM is usually associated with a long history of ear disease. Symptoms of CSOM include otorrhea and possibly otalgia, hearing loss, tinnitus, or vertigo. (See "Chronic suppurative otitis media (CSOM): Clinical features and diagnosis" and "Chronic otitis media and cholesteatoma in adults", section on 'Chronic otitis media'.)

Ear canal symptoms and signs are usually mild compared with acute bacterial external otitis. Swelling typically does not completely occlude the canal. Ear canal findings are focused medially near the tympanic membrane where polyps or granulation tissue may be seen. The tympanic membrane is usually at least partly visible and frequently not mobile on insufflation. A tympanic membrane perforation or retraction pocket may be evident. The pocket can be filled with white, cheesy-looking, keratin debris consistent with a cholesteatoma (picture 8). Patients with these findings should be referred to an otolaryngologist. (See "Acute otitis media in adults", section on 'Management of acute tympanic membrane rupture in acute otitis media' and "Chronic otitis media and cholesteatoma in adults", section on 'Chronic otitis media'.)

Carcinoma of the ear canal — Cancer of the external auditory canal is a rare disease that should always be considered any time there is an abnormal tissue growth in the ear canal or a lack of response to prolonged external otitis treatment [20]. Ear canal cancer occurs far less frequently than auricular cancer. In the early stages, it is often indistinguishable from external otitis. The diagnosis of carcinoma of the external auditory canal is often delayed secondary to misdiagnosis as external otitis.

Mild pain and bloody otorrhea are common symptoms. A friable ear canal lesion with surrounding purulence is a typical finding on otoscopy. Hearing loss and facial paralysis may develop as late signs. The definitive diagnosis is made with biopsy of the lesion or affected area.

Psoriasis — Psoriasis can commonly involve the external ear canal, causing redness and scaling often extending to the conchal bowl and auricle. The clinical appearance of psoriasis in the external canal may vary. (See "Psoriasis: Epidemiology, clinical manifestations, and diagnosis".)

COMPLICATIONS

Complications of external otitis include periauricular cellulitis and malignant external otitis. Periauricular cellulitis presents with erythema, edema, and warmth of the skin around the auricle. Pain is generally mild and systemic manifestations are usually absent, which help distinguish cellulitis from malignant external otitis.

Malignant external otitis — Malignant external otitis (also termed necrotizing external otitis) is a severe, potentially fatal complication of acute bacterial external otitis. Most common in older adult diabetic patients or other immunocompromised individuals, it occurs when the infection spreads from the skin to bone and marrow spaces of the skull base (also involving soft tissue and cartilage of the temporal region).

Patients typically have severe otalgia and otorrhea with pain that appears out of proportion to examination findings. Granulation tissue at the bony cartilaginous junction of the ear canal floor is a classic finding. Edema, erythema, and frank necrosis of ear canal skin may be evident. Cranial nerve palsies are a poor prognostic sign. Patients generally have a markedly elevated erythrocyte sedimentation rate (ESR). Diagnosis is aided with an abnormal magnetic resonance imaging (MRI) or computed tomography (CT) scan showing extension of infection into bony structures. Patients who may have malignant external otitis should be promptly referred to an otolaryngologist.

Malignant external otitis is discussed in detail elsewhere. (See "Malignant (necrotizing) external otitis".)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Acute otitis media, otitis media with effusion, and external otitis".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, “The Basics” and “Beyond the Basics.” The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on “patient info” and the keyword(s) of interest.)

- Basics topics (see "Patient education: Outer ear infection (The Basics)")
- Beyond the Basics topics (see "Patient education: External otitis (including swimmer's ear) (Beyond the Basics)")

SUMMARY AND RECOMMENDATIONS

- **Definition** – The term external otitis (also known as otitis externa or swimmer’s ear) refers to inflammation of the external auditory canal or auricle, usually from infection.
- **Risk factors** – Risk factors for developing external otitis include swimming (or other water exposure), trauma (eg, ear scratching, cotton swabs), occlusive ear devices (eg, hearing aids, ear phones), allergic contact dermatitis (eg, due to shampoos, cosmetics), and dermatologic conditions (eg, psoriasis). (See 'Pathogenesis and risk factors' above.)
- **Clinical features** – External otitis usually presents with ear pain, pruritus, and discharge. Examination findings of external otitis include tenderness when the tragus is pushed or the auricle is pulled, as well as erythema and swelling of the external auditory canal. The otoscopic examination should also assess for otitis media, tympanic membrane perforation, and signs of other disease. (See 'Clinical features' above.)
- **Levels of severity** – External otitis is categorized by severity as mild, moderate, or severe (see 'Severity' above):
  - Mild disease is characterized by pruritus, minor discomfort, and minimal canal edema (picture 3).

- Moderate disease is characterized by pruritus, an intermediate degree of pain, and a partially occluded canal (picture 4).
- Severe disease is characterized by complete canal obstruction, intense pain, periauricular erythema, adenopathy, and fever (picture 5).

- **Diagnosis** – The diagnosis of external otitis is clinical, based upon a characteristic history and physical examination. Cultures are reserved for patients with severe external otitis, immunocompromised patients, and those who do not respond to initial therapy. (See 'Diagnosis' above.)
- **Differential diagnosis** – The differential diagnosis for external otitis includes otomycosis, contact dermatitis, chronic suppurative otitis media, and ear canal carcinoma. Carcinoma of the ear canal is a rare, aggressive disease that is suggested by blood otorrhea, a friable ear canal, and failure to respond to treatment for external otitis. (See 'Differential diagnosis' above.)
- **Malignant (necrotizing) external otitis** – Malignant (necrotizing) external otitis occurs when external otitis spreads to the skull base (soft tissue, cartilage, and bone of the temporal region and skull). Malignant external otitis most commonly develops in older adult diabetic patients or other immunocompromised individuals. Severe pain, otorrhea, presence of granulation tissue in the canal floor, and cranial nerve palsies may be present. These patients should be promptly referred to an otolaryngologist. (See "Malignant (necrotizing) external otitis".)

REFERENCES

1. Stone KE. Otitis externa. Pediatr Rev 2007; 28:77.
2. Beers SL, Abramo TJ. Otitis externa review. Pediatr Emerg Care 2004; 20:250.
3. Centers for Disease Control and Prevention (CDC). Estimated burden of acute otitis externa--United States, 2003-2007. MMWR Morb Mortal Wkly Rep 2011; 60:605.
4. Agius AM, Pickles JM, Burch KL. A prospective study of otitis externa. Clin Otolaryngol Allied Sci 1992; 17:150.
5. Russell JD, Donnelly M, McShane DP, et al. What causes acute otitis externa? J Laryngol Otol 1993; 107:898.

6. van Asperen IA, de Rover CM, Schijven JF, et al. Risk of otitis externa after swimming in recreational fresh water lakes containing Pseudomonas aeruginosa. BMJ 1995; 311:1407.
7. Osguthorpe JD, Nielsen DR. Otitis externa: Review and clinical update. Am Fam Physician 2006; 74:1510.
8. Brook I, Frazier EH, Thompson DH. Aerobic and anaerobic microbiology of external otitis. Clin Infect Dis 1992; 15:955.
9. Clark WB, Brook I, Bianki D, Thompson DH. Microbiology of otitis externa. Otolaryngol Head Neck Surg 1997; 116:23.
10. Roland PS, Stroman DW. Microbiology of acute otitis externa. Laryngoscope 2002; 112:1166.
11. Ahmad N, Etheridge C, Farrington M, Baguley DM. Prospective study of the microbiological flora of hearing aid moulds and the efficacy of current cleaning techniques. J Laryngol Otol 2007; 121:110.
12. Rosenfeld RM, Schwartz SR, Cannon CR, et al. Clinical practice guideline: acute otitis externa. Otolaryngol Head Neck Surg 2014; 150:S1.
13. Llor C, McNulty CA, Butler CC. Ordering and interpreting ear swabs in otitis externa. BMJ 2014; 349:g5259.
14. Munguia R, Daniel SJ. Ototopical antifungals and otomycosis: a review. Int J Pediatr Otorhinolaryngol 2008; 72:453.
15. Vennewald I, Klemm E. Otomycosis: Diagnosis and treatment. Clin Dermatol 2010; 28:202.
16. Ho T, Vrabec JT, Yoo D, Coker NJ. Otomycosis: clinical features and treatment implications. Otolaryngol Head Neck Surg 2006; 135:787.
17. Gehrig KA, Warshaw EM. Allergic contact dermatitis to topical antibiotics: Epidemiology, responsible allergens, and management. J Am Acad Dermatol 2008; 58:1.
18. Sood S, Strachan DR, Tsikoudas A, Stables GI. Allergic otitis externa. Clin Otolaryngol Allied Sci 2002; 27:233.
19. Van Ginkel CJ, Bruintjes TD, Huizing EH. Allergy due to topical medications in chronic otitis externa and chronic otitis media. Clin Otolaryngol Allied Sci 1995; 20:326.
20. Magliulo G, Ciniglio Appiani M. Mucoepidermoid carcinoma of the external auditory canal. Otolaryngol Head Neck Surg 2010; 142:624.

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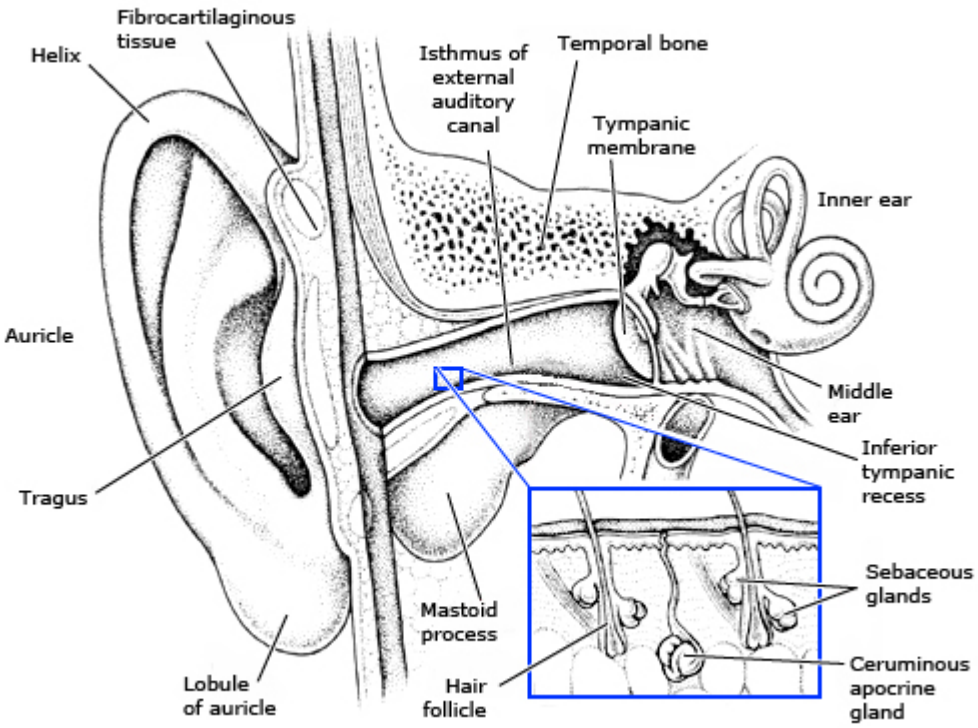
GRAPHICS

Ear anatomy



The external auditory canal is a cylinder measuring approximately 2.5 cm in length and 7 to 9 mm in width, extending from the conchal cartilage of the auricle to the tympanic membrane. It is divided into a lateral (outer) cartilaginous portion that occupies approximately one-third of the canal, and a medial (inner) bony portion that occupies the other two-thirds. Their junction is termed the isthmus and is the narrowest region of the ear canal. The outer cartilaginous portion is lined by thicker skin with numerous adnexal structures, including cerumen glands (a modified apocrine type gland), sebaceous glands, and hair follicles. Cerumen is formed here. The inner osseous portion of the canal contains thin skin without subcutaneous tissue. The inferior tympanic recess is a small depression in the inferior medial aspect of the ear canal, adjacent to the tympanic membrane. Debris can collect in this area and cause or perpetuate infection.

Graphic 57082 Version 7.0

Acute external otitis microbiology

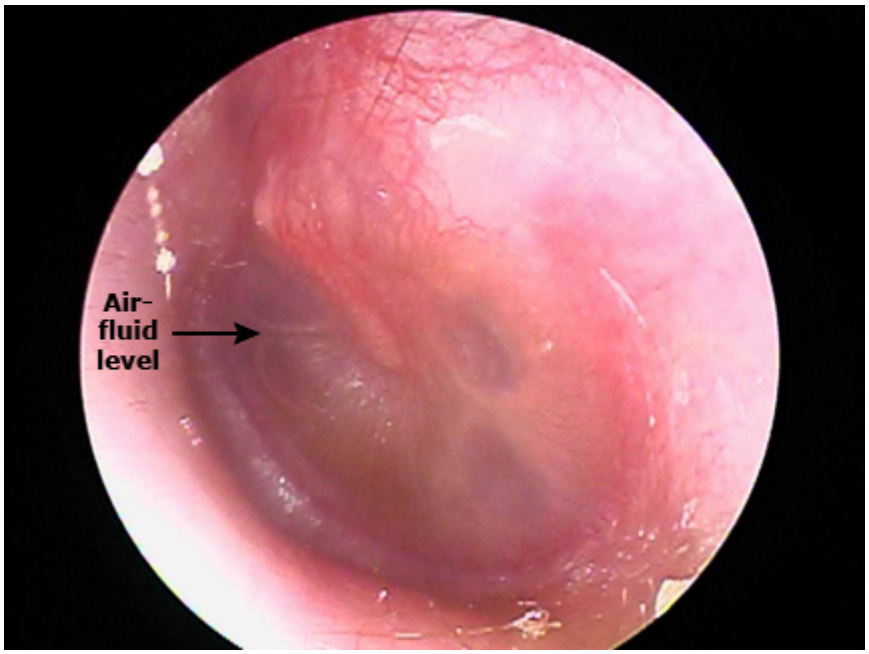
	%*
Organism	
Aerobic bacteria	
Pseudomonas	41
Staphylococcus aureus	15
Anaerobic bacteria	
Peptostreptococcus	22
Bacteroides	11
Fungal	6.5
Mixture of organisms	
Aerobic only	67
Anaerobic only	17
Mixed aerobic and anaerobic	9
Number of organisms	
Single organism	65
2 organisms	24
More than 3 organisms	11

* % of total patients with bacterial who had growth of this organism (n = 46).

Data from Brook, I. Acta Otolaryngol 1980; 91:285.

Graphic 78637 Version 2.0

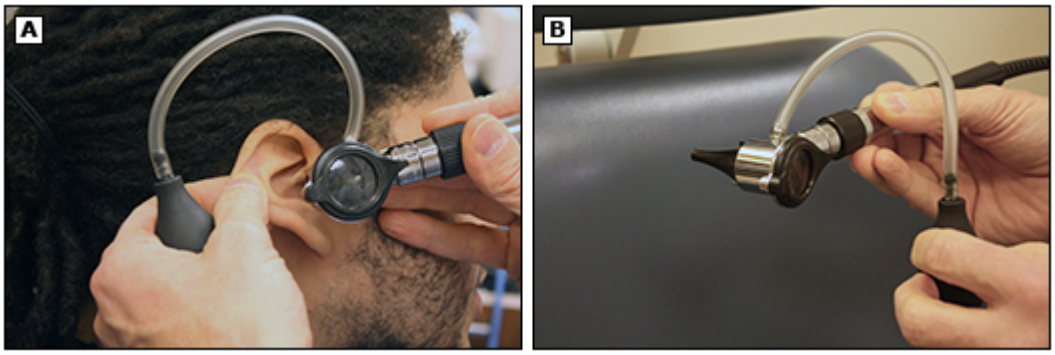
Tympanic membrane with air-fluid levels



An air-fluid level is appreciated when the tympanic membrane appears translucent above and opaque below a line demarcating the separation.

Graphic 67379 Version 3.0

Pneumatic otoscope



Courtesy of Laura Goguen, MD.

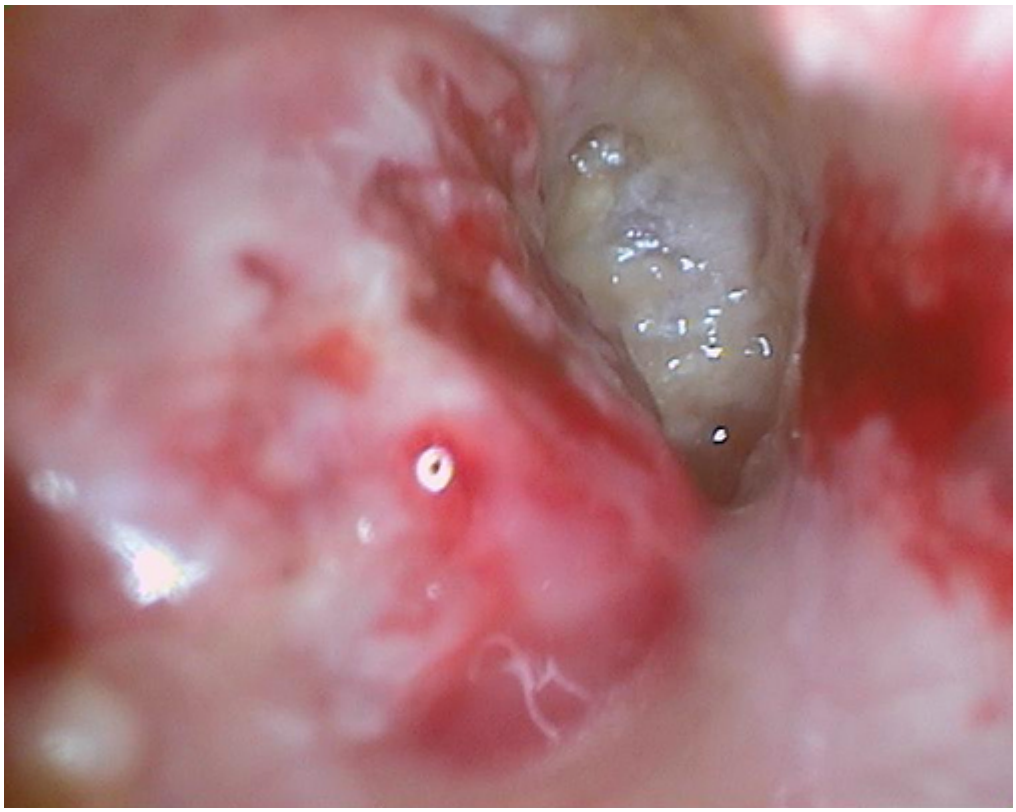
Graphic 93798 Version 1.0

Mild otitis externa

Courtesy of Daniel G Deschler, MD, FACS.

Graphic 83227 Version 1.0

Moderate otitis externa



Courtesy of Daniel G Deschler, MD, FACS.

Graphic 83228 Version 1.0

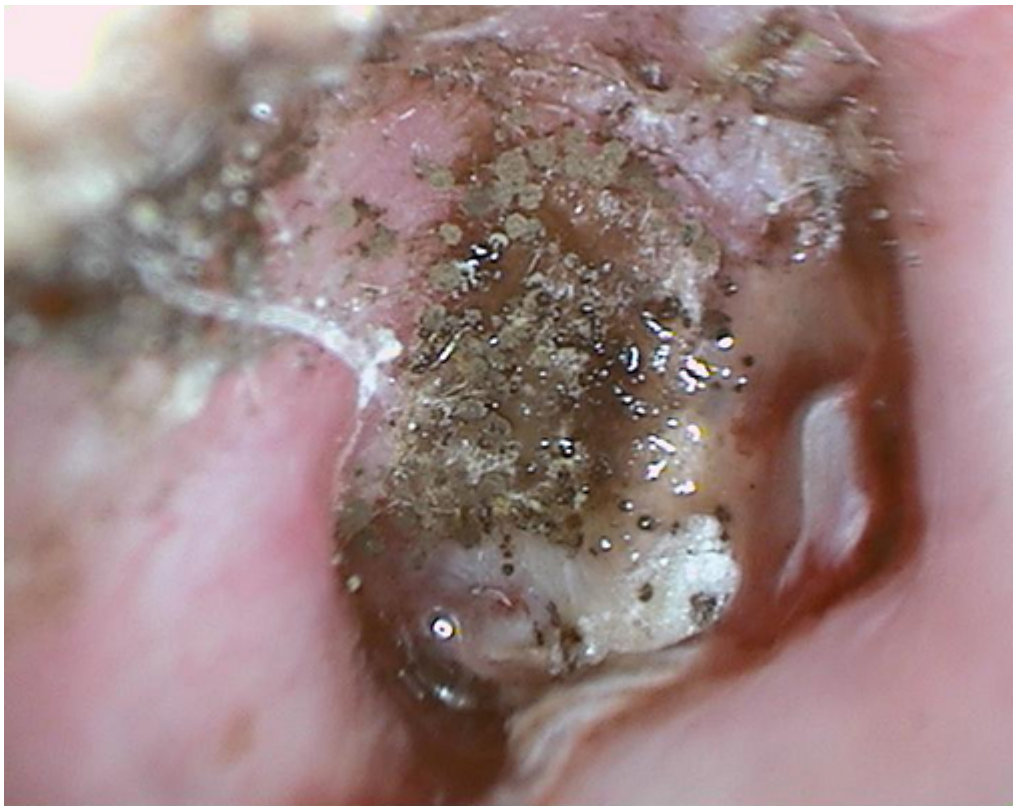
Severe otitis externa

Complete ear canal closure and auricular erythema extending to periauricular tissue, including the face.

Courtesy of Laura A Goguen, MD.

Graphic 55712 Version 1.0

Fungal otitis externa



Courtesy of Daniel G Deschler, MD, FACS.

Graphic 83226 Version 1.0

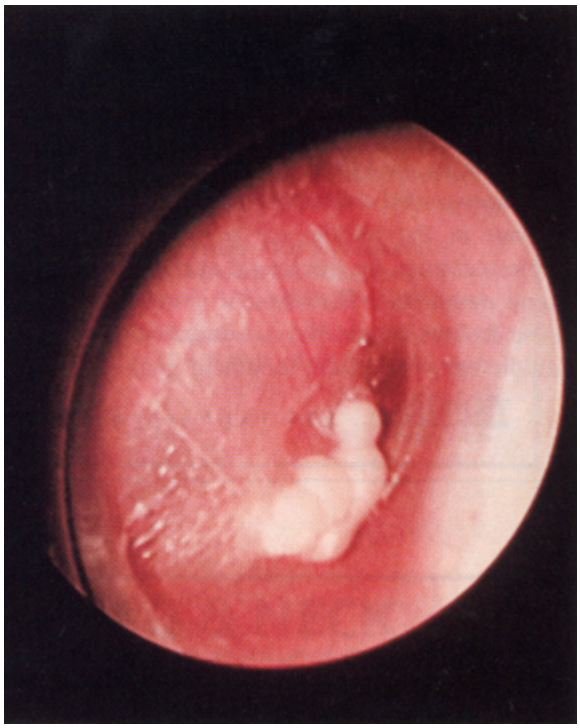
Contact dermatitis from ear drops

Patient receiving ototopical antibiotic drops with persistent pruritis. Note erythema and crusting focused in auricular conchal bowl inferiorly.

Courtesy of Laura A Goguen, MD.

Graphic 70837 Version 1.0

Cholesteatoma



Multiple white pearls on the lateral surface of the right tympanic membrane.

Graphic 55060 Version 1.0