Earache is common. Very common. By the time they’re three, over 80% of Boston’s kids get an ear infection.¹ There are over 25 million medical visits a year for earache,³ and the indirect cost of earaches (parental work lost time, for example) is over $3.5 billion.³

Two thirds of earaches are caused by acute otitis media or otitis externa, but one third are referred pain from a great variety of places: the ear has lots of different nerve connections.⁴

Common causes for earache other than otitis media, otitis externa or barotrauma (diving, explosions) include, in order of frequency: ⁵ ⁷
- abscessed or carious teeth
- temporomandibular joint (TMJ) pain, either from an acute posttraumatic temporomandibular joint capsulitis (a bruise of the jaw joint cartilage), or chronic TMJ pain
- cervical spine pain
- cervical lymphadenitis (swollen infected lymph nodes in the neck)
- tonsillitis
- post-tonsillectomy pain
- acute parotitis (inflammation of the parotid salivary gland in the cheek, whether from viral, bacterial or non-infectious causes)

If you examine the ear of someone with earache and it is normal, consider the alternatives.

If the earache is worse with range of motion of the jaw, and with biting down, and you find tenderness just anterior to the tragus of the ear, where you can feel the TMJ as it is opened and closed, it’s a TMJ problem. If the patient recently took a punch to the opposite side of the jaw, it’s probably acute posttraumatic TMJ capsulitis (bruised cartilage) or even maybe a tear of the cartilage meniscus that floats in the middle of the TMJ; if more chronic, it may be arthritis: TMJ syndrome.

If the ear looks normal, but when you examine the mouth, you find a tooth that is tender when you tap it with a gloved finger or tongue blade, especially if there are visible cavities or redness or swelling near the root, then the cavity or periapical abscess is causing the earache.

Earache with a normal ear exam but tender cervical lymph nodes below the ear indicates cervical lymphadenitis, which may cause pain interpreted as earache.

Many people have sore throat and earache at the same time. If the ear exam is normal, it’s tonsillar pain radiating to the ears. Sometimes, people just complain of an earache without complaining of a sore throat, and when you examine the ears, they’re normal, but the throat shows obvious tonsillitis. Even a lingual tonsillitis – hard or impossible to see on exam of the oropharynx – may cause pain referred to the ear. Peritonsillar cellulitis or abscess may cause severe unilateral ear pain with a normal ear exam.

On the other hand, otitis externa may be hard to detect by looking in the ear; there may be just slight swelling of the external canal, without redness or maceration. And, some people normally have somewhat small and constricted external canals. One clue is that the external canal may be a bit out-of-round, with a narrow valley or crevice at the bottom. If only one ear is affected, you can compare with the unaffected ear canal. But the most important part of the physical diagnosis of otitis externa is tenderness of the tragus or tenderness of the pinna. In simple terms, press on the tragus (the small fleshy protuberance in front of the ear canal), and pull on the pinna (the large major portion of the ear behind and above the ear canal). If either is tender, the patient likely has otitis externa.

The remainder of this handout deals with the external ear and traumatic perforated tympanic membrane. A separate handout discusses otitis media (check http://www.conovers.org/ftp/).
Barotrauma and Traumatic Tympanic Perforation

The most common way to get a perforated tympanic membrane (AKA ruptured eardrum, though in the ED the preferred term seems to be "perf ed TM") is from getting hit in the ear, usually from domestic violence or a street or bar fight. You can also get a ruptured TM from a blast injury (even if just fireworks), from diving, from climbing or flying to high altitude, or from accidentally jabbing it with a Q-tip.

If you have a perforated TM, you usually (~80% of the time) feel fullness, have hearing loss, and sometimes get tinnitus (ringing in the ear). If someone gets severe vertigo after a ruptured tympanic membrane, it might be a perilymphatic fistula or rupture of the round window in the inner ear.

If you see such a patient in the ED, you should consult an otolaryngologist (ENT) urgently. About 90% of civilian perforations will heal in a month with no treatment. Explosion-related blast injuries from war tend to be larger, to have similar symptoms (83% with symptoms) and not to heal as well (only 48% spontaneously heal). From the bombings in 1974 in Birmingham, England, we know that very large perforations (80% or more of the TM) do not heal spontaneously, and that smaller perforations (<80% of the surface of the TM) tend to heal spontaneously; the authors of the study say that you should allow a month for healing of each 10% of the tympanic membrane that is lost.

For at least 2 weeks after a perforated TM, you should not clean the external ear canal (no Q-tips), unless there is visible contamination or evidence of infection, in which case use gentle suction and mopping to remove the debris. Ear drops don’t help; they may well cause harm. Both antibiotic ear drops and ear irrigation make infection more likely. Since moisture makes infection more likely, teach patients to keep the ear dry.

Unless there is a severe infection, oral antibiotics don’t help. If there is a severe infection, prescribe something that covers both Pseudomonas aeruginosa and methicillin-resistant Staphylococcus aureus. Appropriate antibiotics include the quinolones ciprofloxacin (CIPRO), levofloxacin (LEVAQUIN), and moxifloxacin (AVELOX, VIGAMOX). If someone is allergic to quinolones, there is no other oral agent adequate against Pseudomonas. A badly infected TM in a quinolone-allergic patient needs IV antibiotics.

Advice from a Canadian ENT from World War II still seems to the point: The correct treatment of recent rupture of a drum in the forward areas is important and the following are approved principles:

(a) It is essential that no drops or no powder be instilled in the ear. No syringing should be done and no peroxide used.

(b) If there is reason to suspect that the drum may be ruptured, but there is still some doubt because of blood or wax in the canal, leave the ear strictly alone.

(c) The soldier should be warned to keep water out of his ear and avoid violent blowing of his nose.

(d) A plug of sterile cotton should be placed in the canal and evacuation arranged to the nearest otologist.

The only exception is that a referral to an ENT is not urgent, as no additional treatment is appropriate for at least three months. ENTs generally wait 3-6 months for healing to occur before considering surgical repair. Early surgical repair is worse than simply waiting for three or more months.

Otitis Externa

Otitis externa (swimmer’s ear, tropical ear) is inflammation of the external ear canal. It usually starts with itching, then mild pain, then serous (clear) discharge. Later there is severe...
pain and tenderness, particularly when you push on the tragus or pull on the pinna. People often complain of partial deafness from swelling of the tympanic membrane, or mechanical blockage of the swollen external ear canal or from purulent debris.

You’re more likely to get otitis externa in the summer in temperate climates, or in tropical or subtropical climates. This is probably from high humidity and sweating, though it certainly occurs in the winter. I’ve seen winter otitis externa from working out on a treadmill while wearing earbuds, and from wearing ear protectors while using a jackhammer; the common thread seems to be getting sweaty while your ears are plugged or covered.

You have a one-in-ten chance of getting otitis externa at some time in your life (maybe as a kid or maybe as an adult, but rarely when you’re under 2 years old) but only a one-in-a-hundred chance of getting it in both ears.

Your external ear canal is protected by cerumen (ear wax). Cerumen is a combination of dead skin cells and secretions from glands in the canal. It is acidic, contains lysozyme (an antibacterial enzyme), and probably helps keep you from getting bacterial and fungal infections.

Many things make otitis externa more likely. Moisture in the external ear canal is a major cause: swimming for a long time, or frequently, without drying the external ear canal afterwards; sweating a lot for a prolonged period; or wearing earplugs or earbuds (in-ear speakers for mobile devices) all make it more likely. Breaks in the normal protection of skin and cerumen (ear wax) are key: local injury, perhaps from cleaning the ear with Qtips or worse things, makes it more likely. Water contaminated with lots of bacteria getting in the ear may make it more likely, too.

**Stages of Otitis Externa**

Otitis externa is officially classed into preinflammatory, acute inflammatory, and chronic stages.

In the preinflammatory stage, dampness in the external ear canal causes swelling of the lining of the canal. This weakens the skin and obstructs the glands that secrete cerumen. Looking in the ear with an otoscope, you may see nothing other than slight swelling of the lining of the external canal, which may cause a narrow valley or crevice at the bottom of the ear canal. You may see that the lining of the external canal is a bit whitish from the effects of moisture. Sometimes you will see cerumen that is, rather than the characteristic medium yellow or brown, quite soft and pale, and sometimes even whitish, again from the effects of moisture.

If it’s at the mild acute inflammatory stage, you will see redness and mild swelling of the lining of the external ear canal, and perhaps some mild serous (clear) discharge. If it’s at the moderate acute inflammatory stage you will have worsening pain, and on exam, you see purulent discharge and enough swelling that it’s hard to see the tympanic membrane. Tenderness on pressing on the tragus or pulling on the pinna is a hallmark of otitis externa. If the tympanic membrane is red, and there is suspicion of acute otitis media, pneumatic otoscopy may show normal mobility which rules out acute otitis media.

If it’s gotten to the severe inflammatory stage the ear canal is so swollen, and has so much purulent discharge, that it’s completely blocked, and you can’t see the tympanic membrane. You may even find swelling and redness outside the external ear canal, or swollen lymph nodes, particularly below and anterior to the ear.

If the infection spreads outside the ear, particularly when there is osteomyelitis (bone infection) of the temporal bone, we call this malignant otitis externa. Some say that “malignant” is a misnomer and we should use “necrotizing otitis externa” instead, as the process is infectious and not cancerous. But everyone tends to ignore this and still call it malignant otitis media; the non-medical meaning of “malignant” probably still applies pretty well.

Chronic otitis externa lasts more than a month, or occurs four or more times in one year. That’s a problem for ENT specialists and not emergency medicine specialists (or urgent care or primary care physicians) and we won’t deal with it further here.

When, due to severe otitis externa, you can’t see the tympanic membrane with your otoscope, it’s hard to tell if you’re dealing with bad otitis externa or otitis media with tympanic rupture. But the treatment for moderate to severe otitis externa and for otitis media with a ruptured tympanic membrane are the precisely same: ear drops.

---

*Pain in the ear canal and temporomandibular joint region intensified by jaw motion. From the American Academy of Otolaryngology–Head and Neck Surgery Foundation (AAO-HNSF) 2014 Clinical Practice Guideline: Acute Otitis Externa*
which likely will make the patient better faster.19

The most common infecting bacterium is Pseudomonas aeruginosa, the next most common is Staphylococcus aureus; Staphylococcus epidermis and a scattering of other bacteria are much less common, and fungi such as Aspergillus even less common. It’s not uncommon to have a mixture, usually Pseudomonas and Staph together.

Without treatment, only 15% of patients will be better after 10 days. If you prescribe ear drops, whether antiseptic or antibiotic (or, surprisingly, steroid drops alone), 65-80% of your patients will be better at 10 days.26

**Ear Drops**

Many substances have been used to treat otitis externa, on the whole successfully, and this dates back thousands of years.27-28 Vinegar in particular has been used for otitis externa and other infections at least since the time of Hippocrates (~420 BCE).29 Ear drops containing alcohol, for its drying effect, with vinegar or lemon juice or acetic acid to acidify, and possibly with hydrocortisone – which incidentally is effective by itself for otitis externa10-13 – have been used for decades to prevent and treat otitis externa.31 Acetic acid drops with hydrocortisone (VOSOL-HC, ACTASOL) or without hydrocortisone (VOSOL, ACETASOL) are available in the US by prescription. While somewhat effective, don’t prescribe these if there are tubes or a perforation in the TM, as acetic acid might be ototoxic (it might cause temporary or permanent deafness).14

For otitis externa (or otitis media with drainage through tympanostomy tubes or a perforation), prescribe ear drops instead of oral antibiotics.35 Prescribe oral antibiotics in addition to ear drops – don’t substitute for ear drops – only if the patient has diabetes mellitus, local radiation therapy for cancer, has HIV/AIDS, or is otherwise immunocompromised. Also prescribe oral antibiotics if the infection has started spreading outside the ear canal; if frank malignant otitis externa (see below), admit for IV antibiotics.46,47 Treating otitis externa with common antibiotics used for acute otitis media (without eardrops) may slow healing or make the otitis externa more likely to come back.16

Physicians commonly prescribe CORTISPORIN drops: a combination of the aminoglycoside neomycin (good against pseudomonas), the polypeptide antibiotic polymyxin, for additional coverage of Pseudomonas aeruginosa, and hydrocortisone. But neomycin causes lots of allergic reactions – 10-15% of people are allergic to it, and with repeated use non-allergic people tend to quickly become allergic to it46 – so dermatologists and ENTs hate it.39-42 Don’t prescribe it. If you see someone whose otitis externa it getting worse on CORTISPORIN, stop it immediately, and switch to ear drops that combine a quinolone and a steroid. Eczema in the lower ear canal, or just outside it, where ear drops tend to run, may be a clue to eardrop allergy.13 Neomycin is an ototoxic (might cause deafness) aminoglycoside,43-47 another reason to avoid CORTISPORIN, especially if there might be a tympanic membrane perforation hidden behind all the debris in the external ear canal.

Fluoroquinolones (“quinolones” for short) are good for treating both gram positive and gram negative bacterial infections, including Pseudomonas aeruginosa, and without the ototoxicity or allergy concerns of neomycin.44-45 Ciprofloxacin and particularly ofloxacin are also effective against methicillin-resistant Staphylococcus aureus (MRSA),45-47 and likely even against quinolone-resistant Staphylococcus aureus.48 Quinolones seem ideal for otitis externa. Ciprofloxacin (CIPRODEX, CIPRO-HC) and ofloxacin ear drops (FLOXIN) are available. They are better than prior-generation ear drops, and safe with tubes or a tympanic membrane perforation.45-47-49 Quinolone eardrops were quite expensive at first, but then generic ofloxacin ear drops came out and were cheap.60 Unfortunately, in 2015, Valeant cornered the market (bought the rights) to ofloxacin ear drops and raised the price 2,288%. As a result of the massive increase in wholesale cost, local pharmacies stopped carrying ofloxacin ear drops, and then Valeant realized they weren’t making any money and quit selling ofloxacin ear drops. Luckily for everyone except for the Valeant’s officers and shareholders, local pharmacies can still get ofloxacin eye drop for about $5/bottle wholesale, and you can use eyedrops in the ears. (You can’t use eardrops in the eye though.) So you can prescribe ofloxacin eye drops to use in the ear and it works fine. I add to the bottom of my prescriptions “Yes, use the eye drops in the ear. It’s OK. No need to call me!” Usual dosage: 10 drops affected ear once a day for 7 days; lay on side with affected ear up for 5 minutes after instilling.
Antipyrine-benzocaine glycerine ear drops (AURALGAN) are commonly prescribed for the pain of otitis media. But, given the possibility of benzocaine allergy complicating things and probable lack of efficacy, you probably shouldn’t prescribe it for otitis externa. And since the manufacturer of these drops never proved efficacy to the FDA’s standards, the FDA took them off the market in 2015, so they’re not available any more.

Patient Instructions

How you put in ear drops makes a big difference in how they work. If the patients’ ear is full of debris, it’s best for you to gently clear it out; a Frazier (small ENT) suction tip may be helpful. You can tell the patient to gently clean out the ear a bit before putting in the ear drops. Tell the patient to heat the drops to body temperature, perhaps by keeping in a shirt or pants pocket for 5-10 minutes. This prevents dizziness from caloric stimulation (difference in temperature causing circulation in the semicircular canal). Tell the patient to lie on the side with the bad ear up, and put in the drops – gently pulling on the pinna to open the ear canal a bit – and then gently press on the tragus a few times to pump the drops deeper into the ear. Tell the patient to stay on the side for a few minutes. A bit of a cotton ball in the ear before standing helps keep the drops from dribbling all over the place. This can come out in a half-hour or so.

Tell the patient no swimming for at least a week, and to keep hearing aids and ear buds (in-ear speakers) out until the ear is all better.

Treatment Failure

With quinolone ear drops, the ear should be getting a lot better in 2-3 days; if not, the ear needs to be rechecked. If there is still bad pain or now fever, you might want to add an oral antibiotic for possible acute otitis media with perforation. Also, consider malignant otitis media (see below). You also might want to add an ear wick. If necessary, consider intravenous analgesia or maybe even moderate sedation before trying to put the ear wick in; if the canal’s quite swollen, the procedure can be quite painful. Send a culture both for bacteria and fungi. Consider urgent ENT follow-up, as it might not be otitis externa, but cancer.

Prevention

Keeping the ear dry helps prevent otitis externa. But when occupations require wet ears – competitive swimming or diving, for example – prevention is harder. Though 95% isopropyl alcohol drops are widely marketed for drying ears after swimming, there is some significant anecdotal evidence in the literature that a half-and-half mixture of isopropyl alcohol and vinegar is likely more effective. Back in the 1960s and 1970s, the U.S. Navy’s experimental diving unit had major problems with otitis externa, and performed controlled studies of a variety of ear drops for prevention, and found that half-and-half rubbing (isopropyl) alcohol and vinegar (acetic acid) ear drops were only mildly helpful. However, a 1974 Navy study of saturation diving, which is in many ways a worst-case scenario for developing otitis externa, found that acetic acid and aluminum acetate ear drops (e.g., DOMEBORO OTIC, STAR-OTIC, BOROFAIR) were much more effective. However, they also followed a rigid protocol, allowing the drops to stay in the ear for 5 minutes by the clock.

Furuncles

A furuncle, which is an infected (abscessed) hair follicle, may appear in the outer third of the external ear canal — that’s the part that has hair follicles. As with any abscess, you may see purulent drainage or overlying cellulitis. Some people call this focal otitis externa, but it’s really very different from otitis externa. Treatment is the same as for any abscess: local heat, and if you think appropriate, incise and drain. If there is significant overlying cellulitis, prescribe oral antibiotics that cover MRSA, such as sulfamethoxazole-trimethoprim (BACTRIM) or clindamycin.

Malignant Otitis Externa

Think of malignant otitis externa as nasty, nasty otitis externa: infection that spreads beyond the lining of the ear canal, into soft tissues and bone, and maybe even into the brain.
The PQRS is a practitioner reporting program. There are currently financial incentives for reporting specific measures. Eventually, it will become a “pay for performance” system.

In 2014, practitioners who report these measures get a bonus for taking care of Medicare patients. Beginning in 2015, practitioners who don’t report these quality measures will have their Medicare payments cut.

For 2014, two of these quality measures are about otitis externa.

**Measure #91: Acute Otitis Externa (AOE): Topical Therapy**

Percentage of patients aged 2 years and older with a diagnosis of AOE who were prescribed topical preparations.

**Measure #93: Acute Otitis Externa (AOE): Systemic Antimicrobial Therapy – Avoidance of Inappropriate Use**

Percentage of patients aged 2 years and older with a diagnosis of AOE who were not prescribed systemic antimicrobial therapy.

Bottom line: Big Brother is watching!

Fifty years ago or more, before antibiotics, half the people with malignant otitis externa would die from it. Now, the mortality is much, much lower, about 0-15%.\(^9\) *Pseudomonas aeruginosa* is by far the most common bacterium that causes malignant otitis externa. It may invade tissues and cause septic thrombophlebitis (infected blood clots in vessels).\(^9\)

It’s mostly a problem for those with immunosuppression, such as diabetes mellitus or HIV/AIDS. Cerumen in diabetic ears has an alkaline pH rather than a normal acidic pH. This helps explain why malignant otitis externa is most common in diabetics (65-90% of cases). Elderly diabetics also tend to have endarteritis, microangiopathy, and small-artery obliteration, which also contributes.\(^9\) So if you see a bad otitis externa, investigate to see if the patient might have diabetes or HIV, even if previously unrecognized.

If you look in the ear with an otoscope and you see granulation tissue or exposed bone, most commonly in the lower portion of the canal, you’ve made the diagnosis. Even if the ear exam isn’t that impressive, one of the key findings in malignant otitis externa, as with mesenteric ischemia, is pain out of proportion to your exam findings. If you send labs, an elevated ESR (erythrocyte sedimentation rate, “sed rate,” a nonspecific measure of inflammation) in the face of normal temperature and white blood cell count tends to support the diagnosis. To confirm the diagnosis, MRI is superior to CT, and may show enhancement of the dura (covering of the brain) near the ear and involvement of medullary bone spaces. However, a technetium or gallium scan is best, though it will be positive in other local inflammatory conditions, including cancer.

Send a culture of the exudate before you start IV antibiotics. If you’re admitting to a service other than ENT, consult an ENT for a biopsy, because carcinoma may present similarly.\(^9\) Treatment consists of several weeks of intravenous antibiotics, and in children, fluoroquinolones are used only if the benefits outweigh the risks of joint damage. Given the increasing resistance of *Pseudomonas aeruginosa* to fluoroquinolones, antipseudomonal penicillins and cephalosporins are now generally the treatment of choice, combined with an antibiotic appropriate for methicillin-resistant *Staphylococcus aureus*, until cultures are available.\(^9\)

Fungi such as Aspergillus are uncommon as a cause of malignant otitis externa except in HIV patients with CD4 counts less than 50 cells/mm\(^3\).\(^9\) Rare cases of malignant otitis externa due to the fungus *Aspergillus* are treated with intravenous antifungals.\(^9\)

Malignant otitis externa can lead to damage to the facial nerve, necrosis of the tympanic membrane, stenosis of the external ear canal, deformity of the external ear, and sensorineural and conductive hearing loss and maybe even brain infection.

Cholesteatomas are epidermal inclusion cysts of the middle ear or mastoid. Early investigators thought these “pearly tumors” contained cholesterol crystals,\(^8\) but we now know that they are filled with desquamated keratinaceous material, similar to the “sebaceous” epidermal cysts found on the skin. As with epidermal cysts of the skin, they may become infected, causing drainage. Cholesteatomas may also, by either direct extension or becoming infected, result in bone destruction or even intracranial infection. Frequently they may become infected with anaerobic bacteria, resulting in otorrhea with a characteristic and almost feculent odor.\(^9\) Cholesteatomas may also present with a variety of symptoms, depending on the location and extent: vertigo, hearing loss, facial nerve paralysis, or intracranial infection. The classic location for a cholesteatoma is adjacent to the postero-superior portion of the tympanic membrane, but they may appear in other portions of the external ear canal, or perforating through the tympanic membrane.\(^9\)

If infected, cholesteatomas should be treated with appropriate antibiotic ear drops. If suspicious of osteomyelitis, CT or MR imaging would be appropriate; as with any suspected infection or tumor, IV contrast will improve the diagnostic quality of both CT and MR. Patients with cholesteatomas should generally be referred to an ENT for ongoing care.
**Perichondritis**

Infectious perichondritis of the ear is a lot more common these days than it was decades ago. That’s because piercing of the upper ear is now a lot more common. Piercing through the less-infection-resistant cartilage carries a high risk of serious infections. People who perform or get such piercings don’t seem to have a clue about this. Your goal in treating this is healing without permanent deformity. *Pseudomonas aeruginosa* and *staphylococcus aureus* are common pathogens, so ciprofloxacin would be a good choice; it covers both and it penetrates well into cartilage. Sometimes there is an abscess that you need to incise and drain.

**Cerumen Impaction**

A 2008 clinical practice guideline from the American Academy of Otolaryngology–Head and Neck Surgery Foundation is currently the definitive reference for managing cerumen (earwax) impactions. The following represents a distillation of the portions of this guideline relevant to the practice of emergency medicine.

Cerumen impaction – defined by the 2008 clinical guideline as either complete or partial occlusion of the external ear canal with excess cerumen – is found in 1 of every 10 children, 1 of every 20 adults, and in a third of the elderly and in a third of those with developmental delay.

If there are no symptoms, earwax need not be removed. However, cerumen impaction may diminish cognitive function in the elderly, and may interfere with visualization of the tympanic membrane during otoscopy. Cerumen impaction may also cause hearing loss, tinnitus, vertigo, fullness, itching, otalgia, discharge, odor, or cough; however, these may be a symptom of some other problem and the cerumen impaction may be incidental. Removing earwax may help you diagnose a complaint, either by relieving the symptoms or by allowing you to see the external ear canal and TM.

The ENTs say that those with dermatologic diseases of the ear canal, recurrent otitis externa, keratosis obturans, prior radiation therapy affecting the ear, previous tympanoplasty/myringoplasty or canal wall down mastoidecomy should have their cerumen impactions managed by an ENT. I think most emergency physicians, even if they aren’t quite sure what all of those listed diseases are, would agree.

Cerumen removal has risks as well as benefits; it may result in external ear canal pain, abrasions or lacerations, vertigo, syncope or otitis externa. TM perforation and hearing loss are rare complications. However, one study showed a 0.2% chance of TM perforation from irrigation, as well as a similar 0.2% chance of vertigo.

In addition to that above list of “refer to ENT for wax removal” conditions, you should also consider co-existing conditions that might change your choice of how to remove the wax. For example:

- nonintact tympanic membrane (perforation or tympanostomy tube);
- ear canal stenosis (narrowing of the canal);
- exostoses (bony prominences sticking out into the canal);
- diabetes mellitus;
- other immunocompromised states (e.g., HIV); and
- anticoagulant therapy.

There are three main methods to remove ear wax: 1) cerumenolytic agents, 2) irrigation, and 3) manually, using ear curettes, probes, hooks, forceps, or microsuction. There is no evidence as to which of these, or which combination of them, is best.

There is some evidence that cerumenolytic agents may help remove ear wax, but no evidence that any one is superior to the others. Cerumenolytic agents should not be used in patients with otitis externa, as otitis externa is an exclusion for studies of such agents. There are also concerns about a reported 1% skin allergy incidence to 10% triethanolamine poly-peptide oleate (CERUMENEX) drops. There is some evidence that if you put in a cerumenolytic agent before irrigation, it will be easier to get out the wax. Even water or normal saline drops 15 minutes prior to irrigation makes irrigation work better.

When the tympanic membrane is not intact
(perfed TM or tube), you can try mechanical removal in the ED. Don't irrigate: there are worries that irrigation may cause pain, infection, caloric vertigo (dizziness from temperature differentials in the ear causing flow in the inner ear's semicircular canals) or ototoxic hearing loss.

Atrophy (thinning) of the tympanic membrane from prior surgery, including tympanostomy tubes, is a risk for tympanic membrane rupture. So don't irrigate.

If your patient is immunocompromised, as with diabetes mellitus or HIV/AIDS, you should worry about the dampness from irrigation causing malignant otitis externa. So if you need to irrigate such immunocompromised ears, great care is taken to avoid abrasions, and one considers prescribing acidifying ear drops such as 2% acetic acid (vosol, acetasol) 2 drops in each ear BID, or recommending over-the-counter drops such as aluminum acetate (Burow's solution, domeboro).

Mechanical removal of cerumen may be faster than irrigation, allows you a direct view of the external ear canal, and does not make the external ear canal wet, which is thought to be a risk for otitis externa. For patients with a non-intact tympanic membrane (perfed TM or tube) or the potential for it (possible otitis media with ruptured TM), or prior ear surgery, mechanical removal is better than irrigation or cerumenolytic agents. Manual removal, with or without cerumenolytic agents, is preferred over irrigation for those with immunosuppression due to conditions such as diabetes mellitus or HIV/AIDS, or who may be immunosuppressed due to systemic illness, and who are likely to get otitis externa from a wet external ear canal. Few EDs have ENT-type operating microscopes. The best alternative is to use the combination of a curette or plastic ear scoop, a headlight, and an otoscope speculum.

If your patient is taking an anticoagulant, use a curette only with the greatest care. A cerumenolytic and irrigation may be a better option.

In some cases, you might decide you can't safely remove the wax in the ED. If so, make decisions as best you can without seeing the TM. Refer the patient to an ENT, who can remove the wax using a binocular microscope and micro-instrumentation.

The consensus is that some methods of home removal are bad. Oral jet irrigators may cause ear trauma. Q-tips and similar cotton-tip swabs may also cause ear trauma, including a ruptured tympanic membrane. There is even a case report of a fatal brain abscess from retained ear's semicircular canals) or ototoxic hearing loss.

People commonly show up at primary care offices, Emergency Departments, and urgent care centers with foreign bodies (FBs) in their ears. It would be nice to know which is the most effective way to get them out, and which is least likely to result in complications such as tympanic membrane perforation or external ear canal laceration. Unfortunately, there are no controlled studies to tell you the best way to get ear FBs out. There are at least some case series and expert opinions, so let's look at them.

One retrospective case review focused solely on those patients referred to ENTs, so it doesn't likely reflect your practice. It found that about half of those cases referred to an ENT after attempted removal by an emergency physician or primary care physician had lacerations of the external canal. Oops. However we have no information on the corresponding number of foreign bodies that were successfully removed by an emergency physician or primary care physician; seems to me from ~30 years of emergency medicine practice that referral to an ENT is pretty rare. The article also notes that ENTs tend to use a microscope to remove foreign bodies (91% of the time). The most common foreign body in this study was a cockroach (43/98) followed by beads (15/98). The study recommends lidocaine instillation (provided the tympanic membrane is intact) which, in their series, rather than paralyzing the cockroaches, caused them to quickly back out. The
recommendations from this case series are:

- Preremoval hearing assessment for patients in whom damage to the hearing is suspected.
- Removal under direct vision, using a microscope if appropriate. (Most EDs don’t have an ENT microscope, but they usually do have headlights, head-worn magnifiers and ear speculums, which is better than doing it blind.)
- Patients with objects not readily removed by the primary-care physician may require referral to an ENT (duh).
- Mineral oil or lidocaine in the ear may help your remove a live cockroach.

A prospective review from an ENT service in Brazil found that beans were the most common foreign body in the ear. Maybe that just means that kids in Brazil play with beans a lot. A different retrospective review of 141 cases presenting to primary care offices and the Emergency Department of an eye and ear hospital found cockroaches to be less common than that first study (“insects” only 21/141). Beads (31/141), plastic toys (29/141) and pebbles (21/141) were the most common. This study mentioned common instruments available for removal:

- Frazier tip suction,
- Hartman forceps (more commonly called “alligator forceps” given their alligator-like appearance),
- cerumen loops, and
- right-angle ball hooks (right-angle rod tip, with a slight ball at the end).

Right-angle ball hooks have a thin (few-millimeter) rod that makes a right angle at the end, with a blunted end, sufficient to slip into the central hole of a bead, though this sounds easier than it is in practice. My favorite such probe, which I use fairly often, is a Miltex Gross Ear Hook and Spoon (~$50). You can improvise one by straightening and then bending the very tip of a paper clip; this has the disadvantage that it is not smooth at the tip, which makes it harder to slip into the hole in the bead, and makes it more likely to lacerate the ear canal. Fashioning a paper clip into a U loop with a bit of a bend at the end, and never getting the sharp ends in the ear, seems a safer technique. The paper also mentions the Schuknecht foreign body remover, a 22 gauge angled suction catheter with a funnel-shaped tip. My online research in early 2014 shows it is no longer commercially-available, but there are a variety of commercial competitors, including the Vacutact (a $160-for-5 suction tip with a soft tip), and the Vacutip ($140-for-20 soft tips that fit on a 7 French ENT suction catheter).

This study makes a recommendation to avoid any attempts at irrigation if the foreign body could be a small button battery, due to the possibility of damage from short-circuiting the battery with resultant burns to the ear. It goes on to make specific recommendations for referral to an ENT:

- Lack of proper instrumentation
- Lack of staff to adequately restrain uncooperative child (although I would add, lack of capability for moderate sedation of a child)
- Failure to remove foreign body on initial attempt(s)
- Existent injury to the external auditory canal or tympanic membrane
- Object wedged in the medial external auditory canal or up against tympanic membrane
- Glass or other sharp-edged foreign body
- Special circumstances such as insects, putty, and disc batteries

One retrospective pediatric Emergency Department study found only 4/58 ear foreign bodies were successfully removed in their Australian Emergency Department. Another pediatric Emergency Department study, a retrospective chart review of 36 cases over a one-year period, found a better success ratio (53%; maybe doctors in New England are better at this than those in Australia?) but found a higher complication rate in rounded objects that were hard to grasp, and concluded: *...certain foreign bodies (graspable type) of the EAC in pediatric patients can be successfully managed by skilled emergency department personnel with low complication rates, whereas other foreign bodies (nongraspable types) may be better managed by early referral to an otolaryngologist.*

A literature review from 2000 notes that the literature frequently recommends restraining children prior to attempts at removal, but that modern emergency medicine capability makes moderate sedation a more humane option. It also notes that irrigation is contraindicated if there is a tympanostomy tube or ruptured tympanic membrane, or if there is vegetable matter that may swell.

A variety of methods have been reported successful in isolated case reports to remove foreign bodies from the ear. This list might make you more likely to find a method appropriate for you.

**Key Points**

Remove ear wax impactions with ear drops, curette, irrigation, or a combination. Don’t use a curette if anticoagulated. Consider not irrigating if:

- diabetic or HIV (wet ears get infected easily),
- perfed TM or tube in the TM, or
- TM atrophy from prior tubes or big perf.

If irrigating diabetic/HIV ears, prescribe an antimicrobial ear drop after. If needed, refer to an ENT to get the wax out with an ENT microscope.

You can try to remove a foreign body from the ear canal in the ED (see text for methods). But, the complication rate is high. If the ear canal is already damaged, or if the foreign body is rounded and likely hard to grab, you should probably refer to an ENT who can get it out with a microscope.

The only medically-approved use of ear candles is on birthday cakes.
for a particular foreign body:
- Killing an insect with vinegar then removing with a probe (recommendation from the era of the Roman Empire)\(^6\)
- Binding the patient to a table with the affected ear down and then pounding on the table (another Roman Empire recommendation)\(^4\)
- Cyanoacrylate glue on the end of an instrument to remove a bead.\(^9\)
- A Jobson Horne probe (a steel probe with a circle of steel on the end, used sometimes for removing cerumen) or steel wire loop\(^8\)
- Impression materials: pouring a fast-setting material into the ear canal, and then removing the resulting plug including the foreign body\(^8\)
- A paper clip bent into an appropriately-shaped loop\(^7,21\)
- Tiny magnets\(^4\)
- Using ethyl chloride to dissolve styrofoam beads\(^3\)

Finally: ear candles. Sticking a hollow candle in your ear and lighting it is a traditional “holistic” remedy for a variety of ear conditions, including impacted cerumen. It does not remove cerumen, and causes many complications, including occlusions of the external ear canal with candle wax, perfed TM, otitis externa and burns. The only appropriate use of an ear candle is on a birthday cake.\(62,47,25\)

---

**I llustration Credits**

- Page 1, Severe Otitis Externa: James Heilman, MD, Wikimedia Commons
- Page 2, Anatomy of the Ear: BruceBlaus, Wikimedia Commons

**References**

34. Thalhammer ED. A prophylactic program for the prevention of otitis externa in saturation

This work is licensed under the Creative Commons Attribution-Share Alike 3.0 United States License. To view a copy of this license, visit http://creativecommons.org/licenses/by-sa/3.0/ or send a letter to Creative Commons, 171 Second Street, Suite 300, San Francisco, California, 94105, USA.