Chapter e12: Minor Otic Disorders (Cerumen Impaction, Otitis External)

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KEY CONCEPTS

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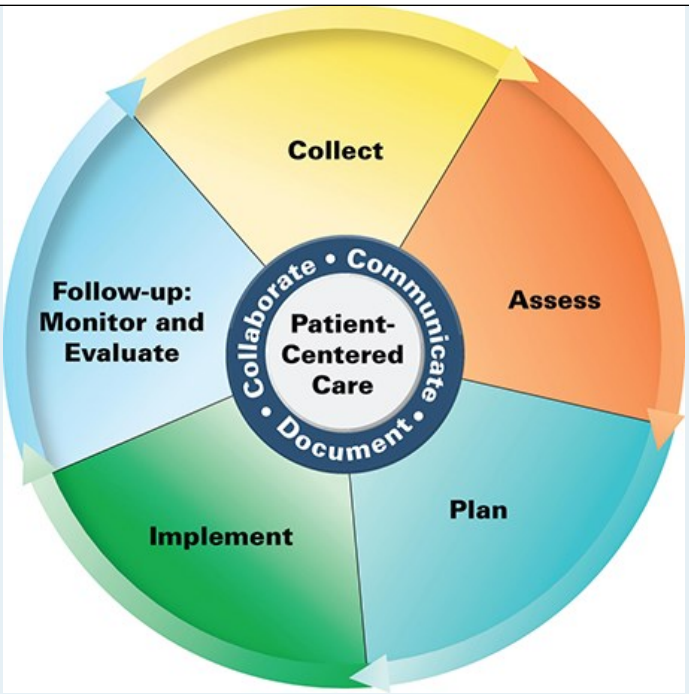
1. The most common pathogens in acute otitis externa (AOE) are *Pseudomonas aeruginosa* and *Staphylococcus aureus*.
2. Topical antimicrobials are the medication and route of choice for the treatment of AOE.
3. Systemic antimicrobials are not warranted for the initial treatment of diffuse, uncomplicated AOE.
4. Pain should be assessed in all patients and therapy recommended based upon severity.
5. Appropriate counseling points for otic administration of medication should be provided to each patient.
6. Cerumen production is a naturally occurring process of the body.
7. Cerumen impaction may cause discomfort, itching, hearing loss, or tinnitus.
8. Cotton swabs should not be used as they can worsen cerumen impaction or cause trauma to the tympanic membrane.
9. Home-treatment options for cerumen impaction include cerumenolytic agents and/or irrigation.
10. Foreign objects such as pen caps, tweezers, or paper clips should not be inserted in the ear canal.

PATIENT CARE PROCESS

Patient Care Process for Acute Otitis Externa (AOE)



Collect

- Patient characteristics (eg, age)
- Patient medical history (eg, history of diabetes mellitus, radiation, eczema, immunocompromised, perforated tympanic membrane, tympanostomy tube, hearing aids)
- Medication allergies (eg, neomycin)
- Social history (eg, water exposure)
- Subjective/objective data: Signs and symptoms of AOE (eg, otalgia, itching, fullness, hearing loss, pain, tenderness, trauma)

Assess*

- History of diabetes mellitus, past radiation, immunocompromised states such as HIV, AIDS, chemotherapy, or ototoxicity
- Presence of tympanostomy tube or perforated tympanic membrane
- History and severity of pain
- Risk of adverse effects from topical medication
- Patient adherence
- Cost of medication

Plan*

- Select a topical antimicrobial therapy with or without accompanying steroidal agent; options include specific medication(s), dose, route, frequency, and duration provided in Table e12-1
- Select pain medication (nonprescription or prescription)

- Educate patient (eg, purpose of treatment, drug-specific information, medication administration technique for otic preparations, avoidance of water sports for 7-10 days)
- Recommend self-monitoring for resolution of signs and symptoms
- Recommend prevention strategies for AOE (eg, acidifying ear drops, thorough drying of the ear canal)
- Make referrals to other providers when appropriate (eg, dermatologist, otolaryngologist)

Implement*

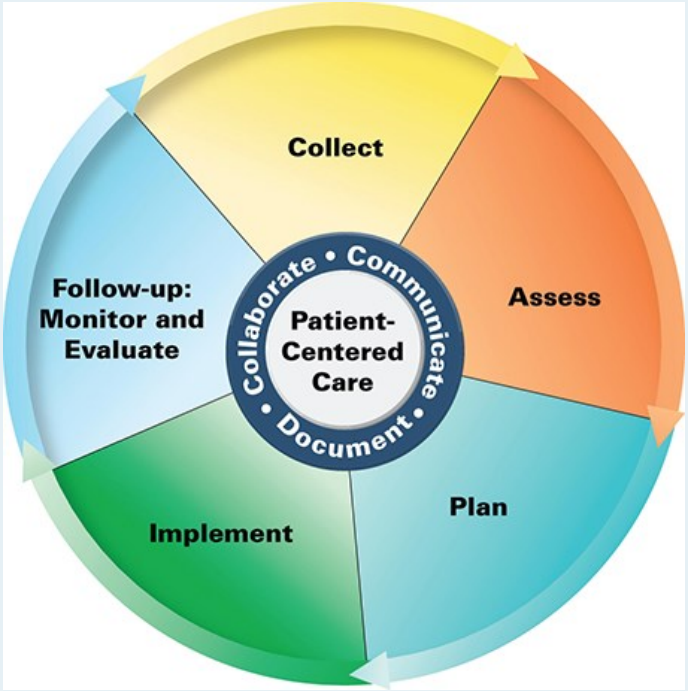
- Provide patient education regarding all elements of the treatment plan and medication administration technique
- Use motivational interviewing and coaching strategies to maximize adherence

Follow-up: Monitor and Evaluate*

- Signs and symptoms improvement (eg, otalgia, itching, fullness, pain, tenderness) within 48-72 hours, symptom resolution may take up to 2 weeks
- Presence of adverse effects (eg, allergic reaction to topical medication)
- Patient adherence to treatment plan using multiple sources of information

**Collaborate with patient, caregivers, and other healthcare professionals.*

Patient Care Process for Cerumen Impaction



Collect

- Patient characteristics (eg, age)

- Patient medical history (eg, immunocompromised state, diabetes mellitus, prior radiation, nonintact tympanic membrane, ear canal abnormalities, hearing aids, dermatologic disorders)
- Social history (eg, ear-cleaning habits)
- Current medications including anticoagulant use
- Subjective data: signs and symptoms of impaction (eg, otalgia, fullness, itching, tinnitus, cough, vertigo, hearing loss)
- Patient communication abilities

Assess*

- History of diabetes mellitus, immunocompromised state, radiation, or ear canal anatomical abnormalities
- Presence of tympanostomy tube or perforated tympanic membrane
- Current hearing aid use
- Limited expressive language (eg, younger child or cognitively impaired patient)
- Patient adherence
- Cost of medication

Plan*

- Decide if self-treatment is an option
- Select a cerumenolytic agent and/or irrigation agent for use
- Patient education (eg, purpose of treatment, medication administration, irrigation technique)
- Self-monitoring for resolution of signs and symptoms of impaction
- Referral to general physician or otolaryngologist if the patient has modifying factors for treatment

Implement*

- Provide patient education regarding all elements of the treatment plan
- Use motivational interviewing and coaching strategies to maximize adherence

Follow-up: Monitor and Evaluate*

- Symptom resolution (eg, otalgia, pain, fullness, itching, tinnitus, cough, vertigo)
- Improvement in hearing loss
- Presence of adverse effects from medication or procedure (eg, dizziness, discomfort, skin irritation, hearing loss)
- Patient adherence to treatment plan using multiple sources of information

****Collaborate with patient, caregivers, and other healthcare professionals.***

BEYOND THE BOOK

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1. Otic administration of medications: Working individually or in teams, develop a handout or short video for patients and caregivers to teach them how to administer medication into the ear of a child or an adult. Be creative in the education models used for patient education!
2. Cerumenolytics: Which one to recommend first? Working individually or in teams, research the various cerumenolytic agents available for patient use and develop a selection algorithm. The algorithm should clearly state which product (with the respective dosing regimen) would be the first to recommend to a patient, then second, and so forth.

ACUTE OTITIS EXTERNA—INTRODUCTION

Acute otitis externa (AOE) is a diffuse inflammation of the external ear canal secondary to infection.[1] The tympanic membrane or pinna may also be involved in this infectious process. AOE may occur at any age but is uncommon in children younger than 2 years.

The hallmark sign of diffuse AOE is intense tenderness of the pinna when pulled, tragus when pushed, or both, which can be inconsistent with signs observed visually, such as redness or areas of cellulitis. Diagnosis of AOE requires a rapid onset (<48 hours) of signs and symptoms of ear canal inflammation within the past 3 weeks.[1] The signs of inflammation include tenderness of the pinna, tragus, or both or diffuse canal edema, erythema, or both. Signs may also include otorrhea, regional lymphadenitis, erythema of the tympanic membrane, or cellulitis of the pinna and adjacent skin.

Symptoms of inflammation include otalgia (70%), itching (60%), or fullness (22%), with or without jaw pain or hearing loss (32%).[1] Pain best correlates with the severity of the disease.[2]

This chapter focuses on AOE, but patients sometimes present with other types of otitis externa. Chronic otitis externa is defined as otitis externa occurring for 3 months or longer. Necrotizing or malignant otitis externa is defined as the AOE infection extending to the temporal bone causing osteomyelitis. This primarily occurs in patients who are older, have diabetes mellitus, or are immunocompromised.

Epidemiology and Etiology

Patients with AOE commonly seek treatment from healthcare providers in the outpatient setting. In 2007, 2.4 million patients received a diagnosis of AOE in the ambulatory care or emergency department setting (8.1 visits per 1,000 population).[3] In ambulatory care visits in the years 2003 to 2007 for AOE, 18.6% were for children 5 to 9 years of age, 15.8% were for children 10 to 14 years of age, and 53% were for adults 20 years of age or older. One study found a peak incidence of AOE in patients 7 to 12 years of age.[4] Ambulatory care clinicians spend approximately 600,000 hours treating patients with AOE, and annual direct healthcare costs for the nonhospitalized setting in the United States are up to $500 million.[1]

1 AOE is predominantly of bacterial origin (98%) in North America.[1] The primary organisms are *Pseudomonas aeruginosa* and *Staphylococcus aureus,* with a prevalence of 20% to 60% and 10% to 70%, respectively. A polymicrobial infection occurs in approximately one-third of AOE cases. A study of 173 patients with AOE in the United States from 2014 to 2016 found the most common pathogens were *P. aeruginosa* (42%), methicillin-sensitive *S. aureus* (22%), and methicillin-resistant *S. aureus* (MRSA) (8.7%).[5] This is the first study to have found higher rates of MRSA in AOE than previously reported. Other AOE pathogens found in this study were *Enterococcus faecalis* (5.2%), *Escherichia coli* (2.3%), *Stenotrophomonas maltophilia* (2.3%), *Streptococcus pneumoniae* (2.3%), coagulase-negative *Staphylococcus* species (2.3%), and *Staphylococcus epidermidis* (2.3%).[5]

AOE is seen usually in warm climates, areas of increased humidity, and patients who have increased water exposure. The most frequent diagnosis period occurs during the summer months. Genetically, patients with type A blood are more likely to be susceptible to AOE.[1] Males and females are affected equally.[4]

AOE commonly is called “swimmer’s ear,” but the etiology may be multifactorial and not associated with swimming.[1] Cerumen in the ear decreases infections, especially from *P. aeruginosa*, as it provides an acidic environment that is hostile to bacterial growth. However, this can be compromised by regular and/or aggressive cleaning of the ear, soap deposits, alkaline eardrops, or exposure to water. Local trauma to the canal, a foreign object,

hearing aid use, and debris from dermatologic disorders such as atopic dermatitis may increase the risk of infection. Excessive sweating and stress could also play a role in the disease. Patients with anatomic abnormalities such as a narrow ear canal, hairy ear canal, or bone spur can be at greater risk of development of AOE.

Preserving a healthy, intact skin barrier and dry external canal are essential in preventing AOE. Using strategies to reduce moisture and decrease water accumulation in the canal can be beneficial. Drying the external ear canal with a hair dryer (on a low heat setting) after exposure to water, using earplugs or a bathing cap when swimming or engaging in water sports, and using acidifying ear drops before and after swimming and at bedtime can assist in preventing AOE.[1] Removing obstructed cerumen and avoiding local trauma to the canal are also beneficial mechanisms to prevent an infection. Objects such as cotton swabs, fingers, tweezers, or pencils should not be placed in the ear canal.[3] Healthcare providers should remove obstructed cerumen and foreign objects, not a patient or caregiver.

Patient Care Process

If a patient presents to the pharmacy or clinic with presumed AOE, it is important to assess the patient and make an appropriate referral for treatment.

Collect Information

First, gather a patient and medication history. Explicitly ask for a disease state and social history to evaluate a potential etiology as well as medication allergies. Information about specific signs and symptoms of AOE such as otalgia, itching, fullness, hearing loss, pain, tenderness, trauma, as well as duration should be obtained.

Assess the Patient

Next, assess the history provided and evaluate the physical findings. If a patient has diabetes mellitus or is immunocompromised, the patient should be referred to a physician due to a potential need for systemic therapy and an increased risk of having necrotizing otitis externa. If there is a history of radiation, systemic antimicrobials may be warranted. In the presence of a tympanostomy tube or a perforated tympanic membrane, ototoxic medications such as aminoglycosides or ones that contain alcohol or an acidifying agent should not be administered.[1] Evaluation of the patient's medical insurance, adherence to treatment, and medication preference, as well as the potential for adverse effects from medications, should occur as these factors play a role in treatment selection.

Pain also should be assessed in a patient with AOE, as it can be severe and limit activities. Assessment can occur with a numeric pain scale for adolescents and adults or faces or visual analog pain scale for children.

Plan for Treatment and Referral

2 Topical antimicrobials are indicated for the treatment of AOE based on efficacy and safety data from clinical comparative studies.[1] They provide a very high concentration of the antimicrobial agent directly to the tissues, which can be 100 to 1,000 times higher than obtained with a systemic antimicrobial.

3 Topical antibiotics versus topical plus systemic antibiotics demonstrated no difference in cure rates of diffuse AOE. Using topical antibiotics alone also decreases the body's exposure to systemic antimicrobials and the likelihood of developing resistance organisms.

Topical treatment should consist of an antimicrobial agent with or without a topical steroid or low-pH antiseptic agent. Topical antimicrobials currently approved for use of AOE are listed in Table e12-1. Three meta-analyses found no meaningful difference in clinical outcomes among these types of topical therapies generally used for the treatment of AOE (drug class, use of quinolone, monotherapy versus combination therapy with or without a steroid).[1,4] The AOE guidelines do not recommend any specific medication.[1] Ciprofloxacin in a one-time dose and with a higher concentration was most recently approved for AOE treatment, but this product has not been directly compared with other agents.[7]

TABLE e12-1

Topical Treatments for Acute Otitis Externa

Generic Name	Brand Name/Generic Availability	Regimen	Additional Information
Antimicrobials			
Ciprofloxacin 0.2%	Cetraxal	0.25 mL in affected ear twice daily for 7 days	0.25 mL is a single-dose container
Ciprofloxacin 6%	Otiprio	0.2 mL in affected ear once	Administered by healthcare professional
Ofloxacin 0.3%	Generic available	6 months to <13 years: 5 drops in affected ear daily for 7 days; ≥13 years: 10 drops in affected ear daily for 7 days	
Antimicrobials with Steroid			
Ciprofloxacin 0.3% and dexamethasone 0.1%	Ciprodex	4 drops in affected ear twice daily for 7 days	
Ciprofloxacin 0.2% and hydrocortisone 1%	Cipro HC	3 drops in affected ear twice daily for 7 days	
Neomycin 0.33%, colistin 0.3%, hydrocortisone acetate 1%, and thonzonium bromide 0.05%	Cortisporin-TC	5 drops in affected ear three to four times daily for no more than 10 days	
Neomycin 3.5 mg, polymyxin B 10,000 units, hydrocortisone 10 mg/mL	Generic available	4 drops in affected ear three to four times daily for no more than 10 days	Suspension preferred
Antiseptics			
Acetic acid 2% solution	Generic available	5 drops to affected ear three to four times daily	Often used for prophylaxis
Antiseptics with Steroid			
Acetic acid 2% solution, propylene glycol diacetate 3%, and hydrocortisone 1%	Acetasol HC and generic available	5 drops to affected ear three to four times daily	

Data from References [1,2,6,7].

Some studies have found earlier symptom improvement of pain, edema, and erythema when a steroid was used in conjunction with an antimicrobial agent.[2] Adherence, adverse effects, and cost also play a role in treatment selection.

Common adverse effects of otic medications are pruritus (5%-7%) and local reactions (4%-5%).[1] Hypersensitivity to aminoglycosides, especially neomycin, can occur in up to 15% of patients.[2] "Home remedies"—such as isopropyl alcohol or acetic acid mixed with isopropyl alcohol or water—have not have been evaluated in clinical trials. Acetic acid may be used topically after water exposure as a prophylactic acidifying agent but has not been

studied.[2] Ear candling should not be used for AOE and may cause harm.[1]

Systemic antimicrobials are not indicted for diffuse, uncomplicated AOE. Patients with a specific patient history as previously discussed or expansion of the infection outside of the ear canal would warrant consideration of systemic therapy.[1] Systemic therapy may also be considered if there is concern that topical therapy would not reach the area of infection. However, it is recommended that a clinician insert a wick or perform aural toilet or both, if the canal is obstructed, and then follow that with topical therapy.

4 Nonprescription pain medications such as acetaminophen or a nonsteroidal anti-inflammatory drug (NSAID), such as ibuprofen, may be recommended for pain if the patient does not have a contraindication to use. NSAIDs could decrease the inflammation process of AOE. An opioid may be considered in conjunction with a nonprescription medication based on the severity of pain. Oral administration of pain medication is the preferred route of treatment.[1] Topical anesthetic eardrops are not indicated for AOE and can mask disease progression. Nonpharmacologic pain treatments such as cold or heat compresses and distraction or relaxation techniques have not been found to be beneficial for AOE.

Implement by Making Recommendations to the Patient

5 It is important to provide appropriate education on administering otic medications to parents and caregivers. Self-administration of otic drops is challenging. It is best to have someone else administer eardrops. Topical otic drops should be placed in the ear canal (affected ear upward) with the patient lying down on their side. The patient or caregiver may gently move the pinna back and forth or “pump” the tragus to ensure the canal fills with the medication and trapped air is released. The patient should remain lying down for 3 to 5 minutes. If a wick is placed, it is important not to remove it until it falls out on its own.

To decrease the possibility of trauma, patients should not try to manipulate the ear or insert anything into the ear.[1] Patients should be encouraged to avoid water activities for 7 to 10 days while being treated. Patients with hearing aids should limit use until symptoms have improved. Earplugs or cotton balls with petroleum jelly may be used to decrease water entering the canal during showering, bathing, or washing of the hair.

Follow-up by Monitoring and Evaluating Outcomes

Explain to the patient that once treatment is started, improvement in signs and symptoms (eg, otalgia, itching, fullness, pain, tenderness) usually occurs within 48 to 72 hours. However, symptoms resolution may take up to 2 weeks. If there is no improvement within the expected period, the patient should seek reassessment by the clinician. The patient should complete the prescribed therapy even if symptoms improve. Lastly, counsel on strategies to reduce moisture and decrease water accumulation in the external ear canal after the infection clears.

Conclusion

AOE is a common ear infection treated with topical therapy consisting of an antimicrobial agent with or without a steroid. Pain also should be assessed and patients should be treated with nonprescription or prescription medications. Patients with AOE should be referred to a clinician for treatment. Pharmacists can assist with patient histories, treatment recommendations, and counseling patients on the appropriate administration of otic medications.

CERUMEN IMPACTION

6 The production of cerumen or earwax is a naturally occurring process of the body. Its purpose is to protect, clean, and lubricate the external ear canal.[8] Cerumen is a mixture of secretions from the ear canal and sloughed epithelial cells.

7 An accumulation of cerumen can physically occlude (partially or fully) the canal and result in patient symptoms and/or an obstructive view of the ear canal, tympanic membrane, or audiovestibular system during an assessment. This is cerumen impaction. Symptoms of impaction include otalgia, fullness, itching, tinnitus, discharge, odor, cough, vertigo, and hearing loss. Diagnosis is formally made upon physical examination with an otoscope.

Epidemiology and Etiology

In the United States, approximately 12 million patients are seen for issues with cerumen and subsequently, 8 million removal procedures are

performed.[8] Cerumen impaction occurs in 10% of children and 5% of adults. More than one-third of developmentally delayed patients and older adults have impaction issues, which are often underdiagnosed. Young children may not be able to verbally described symptoms. Studies estimate that cerumen impaction occurs in 19% to 65% of patients older than 65 years of age. In 2012, Medicare spent almost $50 million on cerumen-related procedures. Patients with hearing aids or dermatological conditions may be at risk for an increased incidence of cerumen impaction.[9]

Patients at a higher risk for impaction should be educated on preventive measures. Patients with hearing aids should have regularly scheduled ear examinations with a physician or audiologist and perform home cleaning as appropriate. Patients should remove the hearing aid for 8 hours each day to decrease cerumen accumulation.[10]

Pharmacists should educate patients on appropriate ear hygiene. The outer ear can be cleaned with soap and water while showering or taking a bath. Excessive cleaning of the ears can result in impaction, irritation, or infection. Cerumenolytic agents may be used prophylactically. Self-irrigation devices may be used to prevent cerumen accumulation. Objects such as cotton swabs or foreign objects should not be placed in the ear canal to facilitate cleaning. These objects can worsen cerumen impaction and cause local trauma to the skin or tympanic membrane. Ear candles are not recommended for use by the Food and Drug Administration and may cause ear trauma.[11]

Anatomy and Mechanisms of Disease

Cerumen is a combination of secretions from sebaceous and ceruminous glands of the outer two-thirds of the ear canal and sloughed off epithelial cells.[8,10] Cerumen is removed from the ear canal in a natural self-cleaning process, which is aided by the movement of the jaw. When the self-cleaning process fails, cerumen can accumulate and cause symptoms of impaction. Some patients also produce excessive cerumen. Cerumen that is not blocking the canal view or causing symptoms should not be altered. Cerumen should be removed before auditory tests, but its presence does not affect ear thermometer measurements.[9]

Patient Care Process

If a patient presents to the pharmacy or clinic with cerumen impaction, it is important to assess the patient and make an appropriate referral for treatment, if indicated.

Collect Information

First, gather a patient's medication history. Explicitly ask about the patient's disease states and medications to determine if self-care is an option. Symptoms of cerumen impaction should be elicited.

Assess the Patient

Patients should be referred for care when they have an immunocompromising condition, diabetes mellitus, renal failure, ear canal anatomic abnormalities, past radiation to the head or neck, tympanostomy tubes, or a perforated tympanic membrane. Patients with diabetes mellitus have a higher pH in the cerumen and infections may occur more frequently.[10] Patients with past radiation may have harder, drier cerumen.[8] Nonverbal or cognitively impaired patients should be referred to a physician for a physical ear exam and determination of diagnosis and treatment. Patients on anticoagulant therapy or who have a disease affecting coagulation or bleeding are at a higher risk of bleeding from certain treatments.

Patients who are asymptomatic and whose ear canal can be visualized upon otoscopy do not require treatment.

Plan for Treatment and Referral

If cerumen impaction is likely, there are four treatment options, of which a combination may be used. Options include observation, the use of cerumenolytic agents, irrigation, and/or manual removal.[8] Clinical evidence does not find one treatment option superior to another. Irrigation and manual removal results in immediate symptom resolution. Cerumenolytics may take a few days to effect removal; these agents are useful for prophylaxis.

Treatments should be selected based on patient resources and potential ease of removal. The goal of treatment is to alleviate the patient's symptoms.

Observation

As cerumen is removed naturally from the ear, over time there can be a spontaneous resolution of symptoms; thus, observation is an option for treatment. However, symptoms can worsen and complete obstruction of the canal can occur.

Cerumenolytics

9 Cerumenolytics are agents that soften cerumen. They may reduce the need for irrigation or manual removal, or they may be used in combination with these treatments.

The three types of cerumenolytics include (1) water-based agents, (2) oil-based agents, and (3) nonwater, nonoil-based agents. Water-based agents induce hydration, thus fragmenting the corneocytes within the cerumen.[8] Examples include acetic acid, docusate sodium, hydrogen peroxide, saline, water, sodium bicarbonate, and triethanolamine polypeptide oleate-condesate.[8,9] Oil-based agents lubricate and soften but do not disintegrate cerumen.[8] Examples include almond, atachis, and mineral oil. Olive oil should not be used due to lack of efficacy.[9] Nonwater, nonoil-based agents mechanisms have not been fully elicited in studies. Examples include carbamide peroxide and choline salicylate/glycerine.

A 2018 Cochrane review found no advantage for any one type of cerumenolytic agent and that an active ingredient was no better than saline or water.[12] Water-based and oil-based treatments did not differ in efficacy. Dosing regimens of cerumenolytics vary, but in general, multiple drops are instilled in the ear canal once or twice daily for several days.[9,10] Benefits of these agents are that the patient or caregiver can administer them at home.

Cerumenolytics are not recommended for children younger than 3 years of age or patients with tympanostomy tubes or a perforated tympanic membrane.[8] Complications of using cerumenolytic agents include dizziness, discomfort, skin irritation, and transient hearing loss.

Irrigation

Aural irrigation flushes out cerumen from the ear canal through the use of water and a syringe or irrigator. Water should be at body-temperature and injected gently to avoid trauma.[9] A 50/50 mixture of hydrogen peroxide and water may also be used.[10] Oral jet irrigators should not be used in the ear due to their high pressure and potential ear trauma.[8] However, some devices have modified tips for aural use.

Pretreatment with a cerumenolytic agent may soften wax and facilitate removal by irrigation. Young children may not cooperate with irrigation of the ear canal. Irrigation should not be performed in patients with anatomic abnormalities of the ear, tympanostomy tubes, a perforated tympanic membrane or past ear surgery. Complications of treating cerumen impaction with irrigation include temporary dizziness, pain, trauma to the skin, or tympanic membrane perforation.[8]

Manual Removal

10 Manual removal of cerumen is accomplished in medical settings using ear probes, hooks, spoons, forceps, or curettes; suction devices may also be used.

Patients and caregivers should not attempt to remove cerumen using objects found in the home. It is best to have an expert or clinician remove cerumen manually. Even an expert may have a difficult time manually removing cerumen from young children.

A benefit of manual removal is that moisture is not introduced to the ear, thus decreasing potential infection.[8,10] Manual removal is usually used in patients with anatomical abnormalities, a history of ear surgery, immunocompromised disease states, diabetes mellitus, tympanostomy tubes, or a perforated tympanic membrane. Complications of using manual removal with a device include laceration of the ear canal, discomfort, bleeding, infection, tinnitus, or hearing loss.[8] Manual removal should be used with caution in patients who are taking anticoagulants or have a disease state that increases bleeding.

Implement by Making Recommendations to the Patient

A patient should be appropriately counseled on how to use a cerumenolytic agent and self-irrigation device. To prevent vertigo, eardrops should be at body temperature when administering them to the patient.[9]

Follow-up by Monitoring and Evaluating Outcomes

Cerumen impaction is resolved when the patient's symptoms resolve or the clinician can visualize the ear canal upon inspection. Patients experiencing hearing loss with cerumen impaction may regain hearing once the impaction is treated. Patients experiencing symptoms after impaction removal should be referred. Pharmacists may also educate patients on preventive measures of impaction.

Conclusion

Cerumen is a natural product of the body, serving as a protectant, emollient, and bactericidal agent of the ear canal. Cerumen should be left alone if patients are asymptomatic and the ear canal can be visualized during otoscopy. If symptoms of impaction occur or the canal is not visualized, several treatment options exist. Appropriately identifying patients who should be referred for care is essential. Home treatment and prophylactic agents available at the pharmacy can be recommended as self-care for many patients.

ABBREVIATIONS

AOE	acute otitis externa
MRSA	methicillin-resistant *Staphylococcus aureus*
NSAID	nonsteroidal anti-inflammatory drug

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SELF-ASSESSMENT QUESTIONS

1. Acute otitis externa is an infection affecting the:
   A. Tympanic membrane
   B. External ear canal
   C. Pinna
   D. Osseous labyrinth
2. Which sign or symptom best correlates with the severity of an AOE infection?
   A. Erythema
   B. Edema
   C. Otalgia
   D. Itching
3. Which of the following patient factors is more likely to increase the incidence of AOE?
   A. Male
   B. Gardening
   C. Type O blood
   D. Living in Florida
4. Which of the following is a primary organism responsible for AOE?
   A. *Streptococcus pyogenes*
   B. *Staphylococcus aureus*
   C. *Klebsiella pneumoniae*
   D. *Escherichia coli* (*E. coli*)
5. Which of the following is a preventive strategy for AOE?
   A. Use a cotton swab in the ear canal after showering
   B. Use a hairdryer on high setting after bathing to dry the canal
   C. Use earplugs when swimming or participating in water sports

D. Use tweezers to remove cerumen in the external canal

6. PK is a 43-year-old woman diagnosed with AOE. She has hypertension and currently takes lisinopril daily. She has no other medical conditions or medications. The physician in clinic asks for your recommendation of a topical treatment plan. Which of the following is the best treatment plan for PK?

   A. Ciprofloxacin 6%.

   B. Acetic acid 2% solution.

   C. Ciprofloxacin 0.3% and dexamethasone 0.1%.

   D. Neomycin 3.5 mg, polymyxin B 10,000 units, hydrocortisone 10 mg/mL.

   E. All of the above are appropriate treatment options.

7. DJ is a 54-year-old man diagnosed with AOE. He has a perforated tympanic membrane from diving and hyperlipidemia for which he takes rosuvastatin. The physician in clinic asks for your recommendation of a topical treatment plan. Which of the following is the best treatment plan for DJ?

   A. Ofloxacin 0.3%.

   B. Acetic acid 2% solution.

   C. Acetic acid 2% solution, propylene glycol diacetate 3%, and hydrocortisone 1%.

   D. Neomycin 0.33%, colistin 0.3%, hydrocortisone acetate 1%, and thonzonium bromide 0.05%.

   E. All of the above are appropriate treatment options.

8. CW is a 5-year-old girl diagnosed with AOE. She has no medical conditions or current medications. The physician in clinic asks for your recommendation of a topical treatment plan. Which of the following is the best treatment plan for CW?

   A. Ciprofloxacin 0.2% and hydrocortisone 1%.

   B. Neomycin 3.5 mg, polymyxin B 10,000 units, hydrocortisone 10 mg/mL.

   C. Acetic acid 2% solution, propylene glycol diacetate 3%, and hydrocortisone 1%.

   D. Alternatives A, B, and C are all correct.

   E. None of the above; children should receive systemic antibiotics for AOE.

9. Which of the following patients should be considered for systemic antibiotics if they are diagnosed with AOE?

   A. A 75-year-old with diabetes mellitus

   B. A 34-year-old professional swimmer

   C. A 12-year-old with rhinosinusitis

   D. A 4-year-old with tympanostomy tubes

10. Which of the following actions is correct when educating a caregiver to administer eardrops to a patient?

    A. Have the patient lie on their back

B. Remove the wick to insert the medication

C. “Pump” the tragus to release air from the canal

D. Remain lying down for 1 to 2 minutes after drops are instilled

11. Which of the following is a symptom of cerumen impaction?

A. Itching

B. Odor

C. Fullness

D. Tinnitus

E. All of the above

12. Which of the following should NOT be used for the treatment of cerumen impaction?

A. Cerumenolytic agents

B. Ear candles

C. Irrigation

D. Manual removal

13. Which of the following patients can be treated with self-care measures for cerumen impaction?

A. A 15-year-old with a perforated tympanic membrane

B. A 32-year-old who is pregnant

C. A 58-year-old with a history of neck radiation

D. A 73-year-old with severe dementia

14. Which of the following statements is TRUE regarding cerumenolytics?

A. Oil-based agents are preferred to water-based agents.

B. Water-based agents are preferred to oil-based agents.

C. Nonwater, nonoil-based agents are preferred to water- and oil-based agents.

D. No type of cerumenolytic agents has been found to be better than another.

15. Which of the following is a potential adverse effect of using a cerumenolytic agent?

A. Dizziness

B. Bleeding

C. Fever

D. Dysgeusia

SELF-ASSESSMENT QUESTION-ANSWERS

1. **B.** Acute otitis externa is a diffuse inflammation of the external ear canal. The pinna or tympanic membrane may be involved, but inflammation of the external canal is required for diagnosis.
2. **C.** Otalgia or pain best correlates with the severity of the disease.
3. **D.** AOE is more predominately diagnosed in patients who live in warm, humid climates, such as Florida.
4. **B.** *Staphylococcus aureus* and *Pseudomonas aeruginosa* are the two primary organisms causing AOE.
5. **C.** Using earplugs or a bathing cap during swimming or water sports can decrease exposure to water and moisture, thus decreasing AOE.
6. **E.** All of the topical treatment options listed are appropriate for PK. She has no underlying disease states or medication concerns to influence treatment recommendations. The AOE guidelines do not recommend one treatment option over another based on clinical evidence.
7. **A.** Since DJ has a perforated tympanic membrane, ototoxic medications, alcohol-based, and acidifying agents should not be used for AOE treatment. Quinolone eardrops may be used.
8. **D.** All three topical treatment options are correct for CW. Children may receive topical treatment for AOE.
9. **A.** A patient with diabetes mellitus should be evaluated for the need of systemic antibiotics in addition to topical treatment for AOE because the disease can impair host defenses.
10. **C.** Topical otic drops should be placed in the ear canal (affected ear upward) with the patient lying down on their side. The caregiver may gently move the pinna back and forth or “pump” the tragus to ensure the canal fills with the medication and trapped air is released. The patient should remain lying down for 3 to 5 minutes. If a wick is placed, it is important not to remove it.
11. **E.** Symptoms of impaction include otalgia, fullness, itching, tinnitus, discharge, odor, cough, vertigo, and hearing loss.
12. **B.** Ear candles should not be used for the treatment of cerumen impaction due to the risk of trauma.
13. **B.** Pregnancy is not a contraindication to home treatment for cerumen impaction. Patients with an immunocompromised state, diabetes mellitus, renal failure, ear canal anatomic abnormalities, past radiation to the head or neck, cognitive impairment such as dementia, tympanostomy tubes, or a perforated tympanic membrane should be referred for care.
14. **D.** A 2018 Cochrane review did not find that one type of cerumenolytic agent was better than another.
15. **A.** Potential adverse effects of cerumenolytic agents include dizziness, discomfort, skin irritation, and transient hearing loss.