

External Otitis

Tania Sih

Definition, frequency and predisposing factors

External otitis (EO) is an inflammatory and/or infectious disease of the external auditory canal (EAC) and the auricular region. It is extremely common and is responsible for 3-10% of patients with otological complaints. About 80% of the EO cases occur during summer. The main predisposing factors are: heat, humidity, anatomical obstructions of the EAC (stenosis, exostosis, cerumen), the use of hearing aids or auditory prosthesis, self-induced trauma (i.e. the use of cotton swabs for “cleaning” the ear) and swimming.

Pathogeny

The main factors involved in the pathogeny of EO are:

1. removal of the cerumen hydrophobic protection of the EAC (water or trauma);
2. exposure of the EAC underlying epithelium to water and other contaminating agents;
3. edema and abrasions of the EAC epithelial layer;
4. fungal infections (opportunistic);
5. bacterial infections;
6. allergic reaction to topical agents (i.e. neomycin), or contact dermatitis (as shampoo, for example), psoriasis or other systemic dermatitis (as seborrhea).

External Auditory Canal

Some anatomical data are important. The lateral 1/3 of the EAC originates from cartilage and the remaining medial 2/3 has a bone origin. A full view of the ear canal and tympanic membrane is achieved during otoscopy by pulling the auricular cartilage backwards and upwards to obtain correct alignment between the fibrocartilagenous canal and the bony ear canal, as there is a difference in the angles between the two. In general, the EAC is a structure that is self-protecting and self-cleaning. The cerumen gradually “moves” towards the exterior, and therefore the use of instruments and excessive cleaning of the EAC can disturb the protective barrier, leading to infection. Cerumen is a combination of secretions produced by the sebaceous and apocrine glands, and together with the epithelium sloughing forms an acidic “cover” with the ability to prevent EAC infections. The normal pH of the EAC is slightly acid (pH 4-5). The two most commonly found

organisms in EAC cultures of normal subjects are *Staphylococcus epidermidis* and *Corynebacterium sp.*

Classification

The EO may be divided into 6 subgroups:

1. diffuse bacterial (acute);
2. local acute (circumscribed);
3. chronic;
4. eczematous;
5. fungal (otomycosis);
6. necrotizing (malignant).

Symptoms

The main characteristic symptoms of any form of external otitis include otalgia, itching, feeling of aural fullness (“fullness in the ear”), reduced hearing and otorrhea.

Clinical Symptomatology

The different manifestations of EO may include edema and hyperemia of the EAC with purulent secretion, collection of white mycelia (candidiasis) or with black spots (*Aspergillus niger*), maculopapule eruption (consistent with allergic reaction), canal thickening and erythema (allergy or contact dermatitis), as well as granulation tissue in the canal caused by chronic infection.

Next, we will discuss the five first subgroups of the EO classification: **a)** diffuse bacterial (acute); **b)** local acute (circumscribed); **c)** chronic; **d)** eczematous; **e)** fungal (otomycosis).

a) Acute diffuse external otitis

The acute diffuse external otitis (ADEO), also known as swimmer’s ear or “pool” otitis, is an inflammatory and infectious process of the EAC, where the main microbial pathogens are *Pseudomonas aeruginosa* and *Staphylococcus aureus*. A change in the pH of the EAC, becoming more alkaline, allows the growth of the pathogens. The alkalization of the EAC includes factors described in the pathogenesis as humidity, water retention when swimming, excessive cerumen removal, excessive cleaning the EAC, local trauma, etc. The signs and symptoms vary from light and moderate to severe, always preceded by itching, edema, pain in the EAC, feeling of aural fullness (“fullness in the ear”), progressing to pain exacerbation (when even chewing movements are uncomfortable), with the EAC edema so significant that the insertion of the otoscopy speculum is impaired, and the presence of green-yellowish otorrhea. The erythema and edema may include the tragus and the auricular pina.

The first step of the treatment is a careful and atraumatic cleaning of the EAC, done by the specialist, preferably with the aid of a microscope. The local manipulation of uncomplicated acute external otitis should be done by the specialist who has experience, ability and the correct instruments. They can accomplish debridement and topical application of acid and drying agents such as 0.25% acetic acid, acetic acid and alcohol solutions, merthiolate and gentian violet. If the pain and edema are intense, a child will not easily allow the cleaning, and sometimes a hard sponge material that expands should be used (Merocel® earwick or Pope Otowick®), that

will facilitate the application of drops in the canal.

A difference should be noted between the otic and the optic or ophthalmologic drops. The otic drops used in the treatment of external otitis should have a lower pH (between 3 and 6) so as to inhibit the proliferation of fungi and bacteria. The otic drops are more acidic than the ophthalmologic and these, on the other hand, are less viscous, which allows their entrance into a narrower lumen, with or without the aid of otowick to transport the medication. Sometimes we find patients that are sensitive, that do not tolerate well the otic drops that are more acid, but tolerate better the more neutral eye drops. There are otic drops available in the market that can be used in the treatment of ADEO, which contain different groups of antibiotics as active ingredients. The combination of neomycin sulphate, polymyxin and hydrocortisone (polymyxin provides reasonable coverage for *P. aeruginosa*, while both polymyxin and neomycin act on *S. aureus*). Hydrocortisone can sometimes leave particles in the canal that adhere to the tympanic membrane and can impair otoscopy. Other aminoglycoside antibiotics such as gentamicin and tobramycin found in ophthalmologic solutions, with or without topical steroid, may be used. Quinolones (ciprofloxacin, ofloxacin, with or without steroid) are an extremely efficient therapeutic option (both in otic and ophthalmic solutions) in the treatment of external otitis because they have a good coverage for *S. aureus* and *P. aeruginosa*. The important points in the treatment of EO are pain control with analgesics and blocking the concha to prevent shower water from having contact with the EAC.

b) Local acute external otitis

The local or circumscribed acute external otitis (LAEO) is also known as furunculosis. It starts in the external 1/3 of the EAC. It is an infectious disease resulting from the obstruction or dysfunction or even trauma of the polymyxin unit. Usually, the pathogen organism is *S. aureus*. The signs and symptoms may vary from redness, itching, erythema, hearing impairment, pustules, until forming the abscess. The diagnosis is accomplished by the physical exam that clearly shows the furunculus. The treatment depends on the infection stage: the profound diffuse infection is treated with local heat, analgesic and oral antibiotic, while the superficial furunculus can be treated with incision and drainage, topical and oral antibiotic and analgesic.

c) Chronic external otitis

In the chronic external otitis (CEO) there is a thickening of the EAC skin caused by a persistent low intensity infection/inflammation. Itching, absence of cerumen, dry and hypertrophic skin, and often with sloughing, are among the frequent signs and symptoms. Sometimes, in the clinical history, a long-term treatment with ear topical antibiotics and oral antibiotics is reported before the patients were referred to an otolaryngologist. The CEO treatment consists of restoring the EAC skin health, by a specialist, with weekly dressings with a microscope, cleaning and acidifying the canal, gradually allowing the return of cerumen. If the specialist uses antibiotic drops with steroids, after the dressing, they should be different from the ones used until then by the other doctors.

d) Eczematous external otitis

Ecematous external otitis (EEO) is an encompassing term that includes different dermatological conditions that predisposes the EAC to external otitis. The list includes atopic, seborrheic and contact dermatitis, lupus, psoriasis, neurodermatitis and childhood eczema. Among the most exuberant signs and symptoms are intense itching, sloughing, formation of skin cracks, crusts, erythema and sores. The analysis should include the dermatological history. This disease is very frequent in patients that use hearing aids. The treatment of EEO should focus on the underlying skin disease, avoiding contact with substances that are particularly antigenic for the patient, topical steroids, oral antihistamine drugs, restoring the EAC pH and local drying agents (when there are moist cracks in the canal skin).

e) *Otomycosis*

Also known as fungal external otitis, otomycosis is responsible for 10% of the external otitis cases in the United States, and in countries with warmer climate this percentage can be higher. The fungal infection has here the three basic situations to proliferate: humidity, heat and darkness. Otomycosis can occur isolated, as a single infection (primary) or superimposed (secondary) to the bacterial disease of the outer ear. It is very common in patients that used topical antibiotics on the EAC for weeks or months. Symptoms are different in the two cases. In the primary form, the itching is intense and in the secondary there is pain in addition to the itching. The most common fungi found in external otitis belong to the *Aspergillus* family - *A. niger* (black), *A. flavus* (yellow) and *A. fumigatus* (gray) - followed by the *Candida* species (*Candida albicans* - white). The diagnosis is made based on the history, the physical examination and culture. The treatment should include meticulous dressing with acidification of the EAC and topical antifungal drops.

A good solution (and economical too) is to “paint” the EAC Merthiolate or gentian violet to promote the acidification and drying of the canal. Besides its drying and acidifying properties, gentian violet has also specific antifungal and antibacterial properties. When associated with persistent canal edema, persistent aspergillosis may require the administration of oral itraconazol.

Complications of external otitis

They vary from minor discomfort to the more severe complications (necrotizing external otitis). We can find cellulitis, chondritis, perichondritis, lateral displacement of the pinna (external ear), and tympanic membrane perforation. An antibiotic against *Staphylococcus aureus* should be used when cellulitis is present, and if *Pseudomonas aeruginosa* is detected by ear culture, a parenteral antibiotic specific for this organism should be used.

Prevention

Patient education is the most important point in the prevention of external otitis. It is important to educate the patient to prevent the risk factors that lead to external otitis. For patients who live in areas with warm and humid weather, or who take frequent showers, or just tend to retain water in the canal after exposure to water, drops of a 95% isopropyl alcohol and 5% anhydrous glycerine (prepared by compounding pharmacies) mixture should be instilled. The ear is then dried with

a hair dryer at medium temperature (pulling the ear backwards). Recently in US market came out a specific ear dryer for the EAC*.

During aquatic activities, patients with a tendency to external otitis should be advised to use silicone ear plugs (not inside the canal, but molded to fit the tragus). A rubber or polyurethane band with velcro, attached to the neck, will hold the plug in place and it will not be lost during swimming maneuvers. Excessive water must be removed, even when the patient is using the plug and the band. The patient should be educated against excessive care in cleaning the EAC, with cotton swabs (e.g. Q-tips), tip of the finger/nail, hairpins, pen caps, etc. The patient should also be warned about not introducing anything into the EAC, as excessive cleaning removes the wax that provided the protective barrier with an appropriate pH.

Recommended readings

1. Dohar JE. Evolution of management approaches for otitis externa.[Review] [49 refs]. *Pediatric Infectious Diseases Journal*. 22(4):299-305. 2003.
2. Roland PS, Stroman DW. Microbiology of acute otitis externa. *Laryngoscope*. 112(6Pt 1):1166-1177. 2002.
3. Ruckenstein MJ. *Comprehensive Review of Otolaryngology*. Saunders, Philadelphia. 2004.
4. Schrader N, Isaacson G. Fungal otitis externa – its association with fluoroquinolone eardrops. [Review]. [6 refs]. *Pediatrics*. 111(5 Pt 1):1123. 2003.
5. Sih T. Otitis externa. In: *Infectologia em Otorrinopediatria*. Revinter, Rio de Janeiro. 2003.
6. Johnson JT, Yu VL. *Infectious Diseases and Antimicrobial Therapy*. Saunders, Philadelphia. 1997.
7. Tsikoudas A, Jasser P, England RJ. Are topical antibiotics necessary in the management of otitis externa? *Clinical Otolaryngology & Allied Sciences*. 27(4):260-262. 2002.

* www.macksearplugs.com/index.htm