

# *External Otitis*

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*Moacyr Saffer and Mauricio S. Miura*

## **Introduction**

External otitis (EO) is characterized by an inflammatory process of the skin in the external auditory canal (EAC). It is considered as a dermatological disease in an otological site. It is important to recognize it in children as the symptoms can be confused with those of acute otitis media, the latter with a high incidence in the pediatric population. EO causes intense acute-onset pain, associated with crying and irritability, and it is a reason for frequent visits to pediatric emergency rooms (ER). Acute diffuse external otitis (ADEO) is the most frequent form of EO.

## **Epidemiology**

The occurrence of EO is estimated as 3 to 10% of the population. Its incidence increases in warm, humid weather, and thus it accounts for up to 20% of the otorhinolaryngological visits during the summer months. People who spend a long time in contact with water, especially swimmers, present a five-fold higher risk of developing EO. Another major risk factor is the presence of skin diseases in the external auditory canal, such as eczema and psoriasis <sup>1</sup>.

## **Pathogenesis**

As the EAC canal is completely lined with skin, it is essential to maintain the protection mechanisms to prevent EO. Among the main forms of protection, we can mention unbroken skin, wax production, maintenance of the local microflora, acid pH and the child's immunity.

The skin of the outer third of the EAC is characterized by being thicker and having sebaceous and apocrine glands. It lines the cartilaginous part. In the external two-thirds that line the bony portion, the skin does not have much subcutaneous tissue, and is very thin, in constant contact with the periosteum which is richly innervated and very sensitive. This characteristic renders the manipulation of this EAC region highly responsive to painful stimuli, especially to lesions with breaks in the skin <sup>2</sup>.

Wax is an association between the secretions of the apocrine and sebaceous glands on the EAC skin, which are added to epithelial scaling. It renders the skin impermeable, besides acting as a bactericide due to the presence of lysozime. The external ear has a self-cleaning mechanism where the epithelium migrates from the tympanic membrane (TM) towards the auricle as though it were a "rolling carpet" which carries the excess wax outwards, a process that takes 6 to

12 weeks<sup>2</sup>. Parents often tend to use Q-tips in their children's ears to clean them. The Q-tip diameter is larger than that of the EAC of children, and instead of removing the wax it pushes it back into the canal, forming real plugs of compacted wax against the tympanic membrane (TM). This procedure is harmful from the medical viewpoint, since the TM remains hidden behind the wax and either makes it difficult or prevents a differential diagnosis with middle ear illnesses, especially Acute Otitis Media (AOM). The use of Q-tips or other objects to clean the ear is also a common cause of trauma with injury of the skin and of the TM.

The environment of the EAC has an acid pH, between 6.5 and 6.8. The balance between these local factors creates an environment that allows the presence of saprophytic local flora (*S. epidermidis*, *Corynebacterium sp.*, among others) protecting the EAC against invasion by pathogenic microorganisms. In external otitis there is a break in this homeostasis, and skin alkalinization as well as change in local microflora are seen. Water removes the EAC waterproofing factors provided by the wax, besides causing skin maceration and alkalinization<sup>2</sup>. When the protection is broken down, invasion of pathogenic bacteria can occur leading to EO. This is due to the fact that the EAC skin is much more exposed to water, especially in summer, when children spend a lot of time in swimming pools, in the sea or river. The same occurs in small children whose ears are immersed in water while taking a bath.

Immunodepressed or immunosuppressed patients may present recurrent external otitis. It should be warned that the EO in these patients usually evolves to a more severe form with a worse prognosis<sup>1</sup>.

### **Microbiology**

*Pseudomonas aeruginosa* is the most frequent bacteria in EO (51.2%)<sup>3</sup>. It is a microorganism that inhabits humid places and grows preferentially at temperatures above 30 degrees. It develops on the surface of water, mainly in swimming pools, and the chlorine used in the water does not affect its proliferation. It rarely causes skin infection in healthy people, AEC skin being an exception. It is believed that there is a phenotype with a greater affinity for the EAC epithelium<sup>1</sup>.

In EO *P. aeruginosa* can form a biofilm. The bacteria join together forming cellular communities with flow channels to supply nutrients and excrete metabolites. Besides this, the biofilm protects the bacteria making it difficult to remove them mechanically. Resistance to antibiotics increases, justifying the topical use as preferential treatment. *P. aeruginosa* is characterized by producing pigments such as pyocyanin, pyorubin, pyomelanin and others, which could have a protection function while adapts to the environment. In a patient with EO, the greenish color suggests pyocyanin produced by the bacteria<sup>1</sup>. Other bacteria present in the EO, although less frequent, are *Staphylococcus aureus* (11.2%), besides *Proteus sp.* (6.6%) and Enterobacteria (4.4%)<sup>3</sup>.

### **Diagnosis**

Older children refer earache, which may be associated with hearing loss and otorrhea. Otagia is intense, becomes exacerbated when the pinna and area close to the external meatus are touched, and there is also pain while chewing. Children under two years of age do not yet localize the pain, and cry and become irritable

when they have EO. They raise their hand to the ear suggesting a location for the problem, but the diagnosis is only performed by otoscopy. In the initial stage, the skin may present hyperemia, with a goose-flesh aspect, similar to an orange peel. During the evolution of the process, hyperemia increases and secretion begins to appear. At this time, it is important to find out whether this secretion comes from the middle ear and is caused by tympanic perforation. The difference between secretions is the presence of a surfactant substance of the mucous secretions, with bubbles. As a consequence of the inflammatory reaction and edema, the diameter of the auditory canal will be reduced and sometimes even obstructed. This factor makes it difficult to introduce the otoscope for a differential diagnosis from acute otitis media (AOM). The clinical aspect is important under these circumstances, relating a hot climate to a history of swimming in swimming pool, the sea, lakes or rivers, associated with pain when compressing the ear, and hyperemia and edema of the canal skin. In AOM no changes in the EAC are visualized and the compression of the tragus does not produce pain. Also, it is often preceded by a virosis <sup>1</sup>.

### **Treatment**

The main reason for the patient's visit is pain. The use of systemic medications for analgesic purposes is appropriate, because the topical use is not effective on the keratinized surface of the skin. The use of paracetamol, ibuprofen or codeine-based medications usually leads to good results <sup>1</sup>.

The main specific therapeutic measure is removal of the debris accumulated in the external auditory canal (epithelial maceration, secretions, water). The patient should be advised not to wet the ear while bathing, and the use of silicone ear protectors or cotton balls soaked in oily substances (Vaseline, olive oil, almond oil, etc.) is prescribed <sup>4</sup>.

The use of otological drops with antibiotics is indicated in cases where the site of infection is the canal, without spreading to adjacent areas. There is no need for a systemic antibiotic in these situations. The antimicrobial component of the otological drops assumes that the infection is caused by the most frequent bacteria known in EO. A culture of the secretion of external otitis is limited to the cases in which there is resistance to treatment and to patients with immune deficiency. There are several commercial preparations that can be used, associated or not with steroids. The most widely used contain polymyxin B, neomycin, gentamicin, chloramphenicol, ciprofloxacin and tobramycin. In most cases drops are used 3 to 4 times/day, for 3 to 5 days, and it should be stressed that the medication must reach the affected area of the canal. Studies on the use of a topical steroid in solutions for EO indicate a reduction of the time to pain relief, justifying its use<sup>5</sup>. The use of acetic acid to prevent and treat cases of external otitis comes from the period before the discovery of antibiotics. To acidify the skin, topical drops of a 2% solution of acetic acid are used, in aluminium acetate or 5% in isopropyl alcohol, which also has a bactericidal effect on *Pseudomonas aeruginosa*. A useful homemade preparation is 2:8 vinegar and alcohol solution. The disadvantage is that it causes burning and pain on irritated and inflamed skin, which has a negative influence on the compliance of a patient who often has to use it many times a day<sup>1</sup>.

Among the cases of failure in using topical medication we can mention the following:

1. Difficulty in getting the medication to reach the affected area (edema closes the canal). Management: use fragments of merocel or cotton wool in the form of a spindle or candlewick that penetrates the canal and must be impregnated with the medication, wetting it constantly. It must be replaced every 24 hours.
2. Presence of secretion and epithelial scaling in the EAC, preventing contact with the bactericidal agent. Management: carefully remove all the secretion and epithelium with an aspirator or mounted cotton wool. .
3. Allergy to some of the medications prescribed for local use. Usually it is caused by aminoglycosides or furacinic derivatives. Management: replace by topical quinolones.
4. The patient does not comply with medication use: 38% of the patients will use the medication three times/day; 69% of the patients will use the medication twice a day; 80% of the patients will use the medication once a day.

## References

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