Otitis externa: a clinical review

This article provides a clinical overview of otitis externa, focusing on clinical aspects of the aetiology, diagnosis and management of this important and debilitating condition.

Otitis externa is an inflammation of the lining of the outer ear canal with or without involvement of the pinna. When severe, the condition can be debilitating and can affect the patient's quality of life because of its recurrent nature (Ali et al, 2008).

The condition can be classified according to the aetiology as infective, non-infective dermatitis or mixed aetiology (*Table 1*).

Incidence

Otitis externa is estimated to affect 10% of the population during their lifetime: the prevalence is 0.4% per year (Bojrab et al, 1996). Between 5 and 20% of patients attending ear, nose and throat clinics are referred with otitis externa (Hawke et al, 1984). It can affect any age group.

The normal healthy ear canal

'External ear' refers to the pinna, concha, external auditory meatus and tympanic membrane. The lateral one third is cartilaginous, the medial two thirds is bony, and the average length is 2.5 cm. The pinna and cartilaginous ear canal contain elastic cartilage that is covered by skin; its appendages include sebaceous glands, sweat glands and hair along with a small amount of subcutaneous fat. The epithelial cells of the ear canal skin migrate laterally from the tympanic membrane and help in self-cleaning of the canal.

Cerumen (ear wax) is a result of secretions produced by the sebaceous and sweat (apocrine) glands admixed with desquamated epithelial cells. Cerumen physically protects the canal skin and also has antimicrobial properties (Chai and Chai, 1980).

Table 1. Classification of otitis externa

Infective	Bacterial
	Fungal
	Viral
Non-infective dermatitis	Allergic
	Eczematous
	Irritant
Mixed	Combination of infective and non-infective factors

Mr Surya Narayan *is Consultant Ear Nose and Throat Surgeon, East Lancashire Hospitals NHS Trust, Royal Blackburn Hospital, Blackburn BB2 3HH and* **Mr Andrew Swift** *is Consultant Ear Nose and Throat Surgeon, University Hospital Aintree, Liverpool*

Correspondence to: Mr S Narayan (drsury@gmail.com)

Aetiology of otitis externa

Bacterial infection of the ear canal is often caused by local trauma. Trauma may be self inflicted from cotton buds or other objects that are used to scratch the ear. Patients with sharp nails may deny causing trauma by scratching, but may scratch their ears involuntarily while asleep. Artificial nails are long and insensate, and may harbour infection (Baran, 2002). The chemicals used to manufacture artificial nails can also cause allergic reactions (Lazarov, 2007). In children, insertion of foreign bodies may predispose to local infection.

Fungal infections are more likely to result from wet soggy skin in the ear canal. Infection may arise after swimming and showering, or following the use of antibiotic ear drops that alter the normal protective bacterial microflora. Otitis externa may also follow middle ear disease with a discharging infected perforation.

Otitis externa can be induced by hearing aids as a result of retention of wax and moisture, and is particularly likely if the aid is not kept scrupulously clean (Ahmad et al, 2007) or if there is a perforation. External ear infection has also been related to the use of stethoscopes (Brook, 1997).

Other predisposing factors include diabetes, immune deficiency, eczema and psoriasis. Inflammation can also result from allergy to antibiotic ear drops, metals such as nickel that is used in jewellery and, rarely, the material used in hearing aid moulds (Sood and Taylor, 2004).

Pathophysiology

Any situation that disturbs the protective lipid layer and/or the acidic coat of the ear will predispose to otitis externa (Russell et al, 1993). Water and moisture change the Gram-positive skin flora to Gram-negative ones.

The condition becomes recurrent or chronic following a cycle of events that includes itching, scratching and wet, soggy skin, wax or discharge from a perforation. Non-infective dermatitis can lead to infection by scratching and constant contact of the skin with infective secretion or topical antibiotics can cause further chronic inflammation of the skin. Thus a vicious circle of events contributes to chronicity of the condition. Recalcitrant infection can also be caused by biofilms that impart resistance to host immune defence mechanisms as well as to the antibiotic treatment.

Generally, otitis externa affects the whole of the ear canal and may be dry or associated with purulent dis-

charge. In contrast, a furuncle presents as an exquisitely localized swelling in the cartilaginous hair-bearing skin of the ear canal.

Microbiology

Around 90% of the normal flora in the external auditory canal is accounted for by *Staphylococcus* spp., *Corynebacterium* spp., streptococci and enterococci (Stroman et al, 2001). *Pseudomonas aeruginosa* has been described as the commonest pathogen in otitis externa, followed by *Staph. aureus*, *Candida* spp. and anaerobes (Ninkovic et al, 2008).

Clinical features

The two most common symptoms of external otitis are pain and itching. Bacterial infections present are generally painful, probably exacerbated by tightly adherent skin within a fixed bony canal.

Examination of the ear canal in otitis externa will normally show erythema and soft tissue swelling within the canal (*Figure 1*) and around the ear. This may or may not involve the pinna. A gentle pull on the pinna or pressure on the tragus evokes marked tenderness. Severe infection can result in a post-aural swelling that pushes the pinna outwards, mimicking mastoiditis.

In mastoiditis, the pinna is displaced downwards and outwards and swelling extends superiorly and posteriorly to the pinna. The tenderness is also more marked over both the mastoid region posterosuperior to the pinna and the cymba concha of the pinna (that overlies the mastoid antrum); in contrast, tenderness of the tragus or mastoid tip is classical in external otitis. Patients with mastoiditis tend to be systemically quite unwell.

Detailed assessment of the ear canal or the tympanic membrane is often difficult because of the tenderness and narrowing of the ear canal, and may require the use of suction and a microscope. It is important to visualize the tympanic membrane to rule out a potentially serious underlying condition such as cholesteatoma and to detect tympanic membrane perforation with otitis media being the cause of the otitis externa.

Fungal infections are characteristically very itchy. *Candida* spp. presents as cheesy white debris. *Aspergillus* spp. (*Figure 2*) manifests itself with hyphae and black or yellow spores, according to whether the infection is caused by *Aspergillus niger* or *Aspergillus flavus*.

Viral infections are typically extremely painful, and present with vesicles over the pinna, ear canal or the drum (myringitis bullosa). The infection may present with bleeding from the ear which, unlike an acute otitis media, fails to relieve the pain. Herpetic infection can affect the geniculate ganglion resulting in facial palsy, as in Ramsay–Hunt syndrome.

Allergic or eczematous inflammation causes swelling and occlusion of the canal wall. Tenderness is mild unless secondarily infected and the surrounding skin is often dry and flaky (*Figure 3*). The ear canal often contains debris formed by a combination of serous discharge, wax and desquamated skin.

Malignant otitis externa is a uncommon but serious condition that occurs in elderly diabetic patients. It presents with persistent severe pain in the ear, discharge and granulation in the floor of the external ear canal. This condition, which is caused by *Pseudomonas* spp., can lead to bone erosion, cranial nerve palsy and intracranial complications if not treated aggressively. Rarely persistent discharging ear can harbour malignancy such as squamous cell carcinoma.

Figure 1. Coronal computed tomography scan of temporal bone showing the soft tissue swelling within the external auditory meatus.

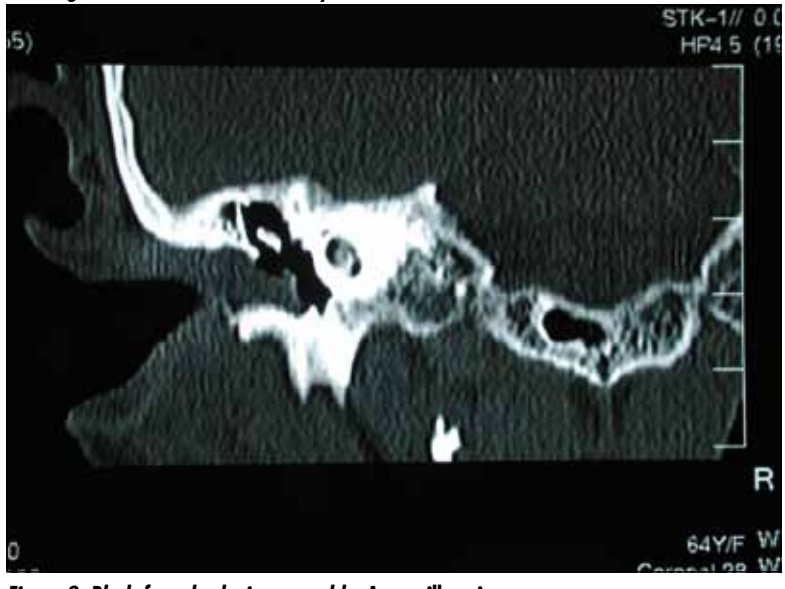
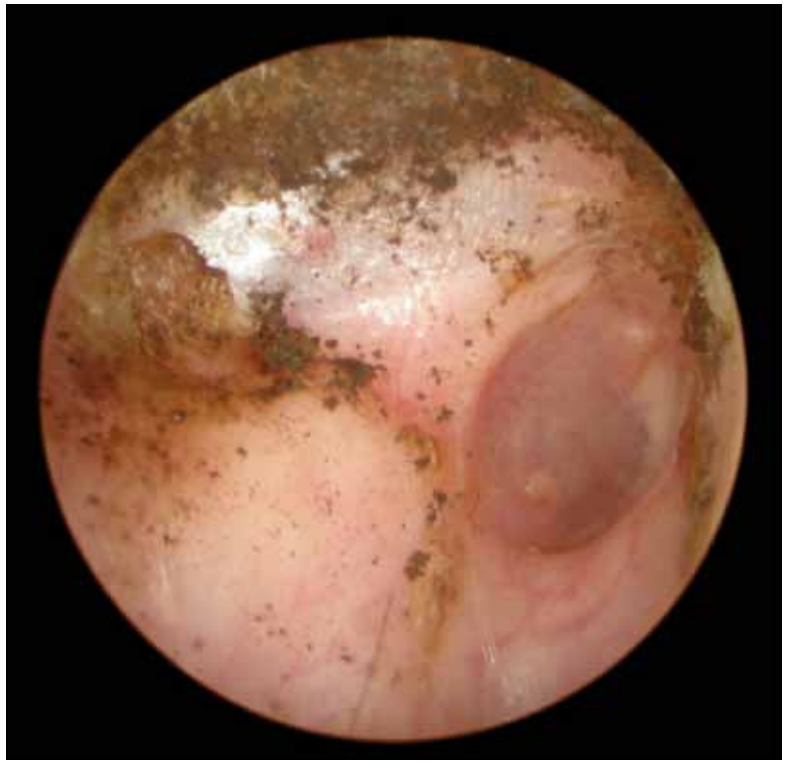


Figure 2. Black fungal colonies caused by* Aspergillus niger *spp.



Clinical evaluation and investigation

The clinical history should include the duration of symptoms and details of recurrence. A search should be made for any predisposing factors.

The salient points in the examination should note the site and degree of tenderness, the extent of inflammation, the patency of the external meatus and the presence of discharge. The drum may not be visible as a result of localized swelling of the ear canal, and it may be necessary to clean the ear with the help of a microscope before the drum can be visualized.

A microbiological swab of the ear discharge should be taken for bacterial and fungal culture and sensitivity, especially in recalcitrant cases.

Systemic diseases such as diabetes and immune deficiency should be excluded in patients with persistent or recurrent infections.

Management

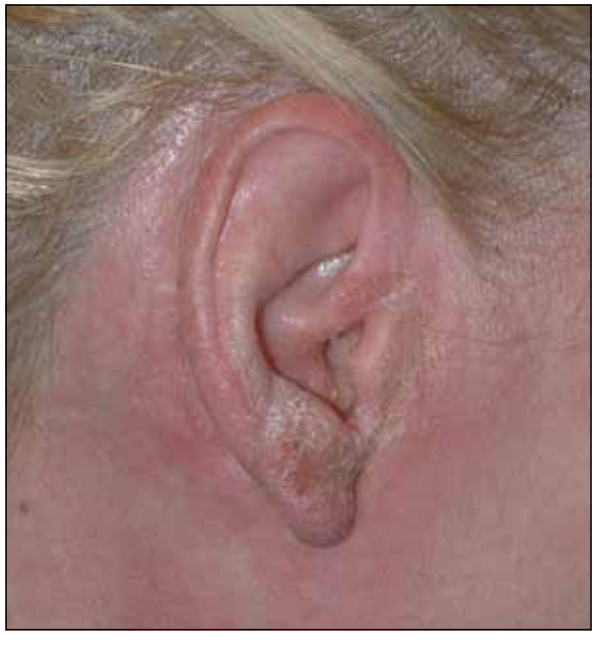
Aural toilet

Cleaning debris from the ear remains the mainstay of treatment in most forms of external otitis, particularly in diffuse eczematous inflammation. This can be accomplished by loosely woven sterile cotton on a probe in a non-ear, nose and throat setting. Microscopic suction with a fine disposable sucker is the most effective method of clearance. Once the ear canal is cleaned, the ear drum can be properly assessed.

Once clean, ear drops will reach the whole length of the ear canal and the tympanic membrane. Aural toilet can be challenging if the ear canal is very narrow, swollen or tender and such situations demand very precise gentle touch.

Syringing the ear should be avoided as severe complications can result (Blake et al, 1998).

Figure 3. Eczematous inflammation of the external ear.



Topical therapy

Topical therapy can be used in the form of drops, spray, powder, ointment or cream.

Topically administered medications work better than systemic ones, as the latter do not always reach the ear in sufficient concentration, owing to the poor blood supply of the skin of the ear canal. Several preparations are available including antiseptics, antibiotics and steroids, and in various combinations.

Antibiotic ear drops or sprays are normally prescribed for bacterial and fungal infections. In a clinically confirmed infection, it is appropriate to use topical aminoglycosides or quinolones. A topical antibiotic–steroid preparation works significantly better than either a single topical antibiotic (Mosges et al, 2008) or topical steroid drops (Abelardo et al, 2009). Ear drops containing ciprofloxacin, gentamicin or polymyxin B appear to be most effective against the common ear pathogens (Ninkovic et al, 2008). Ciprofloxacin or ofloxacin otic solution has a wide spectrum of activity. The time to cure is significantly less with ciprofloxacin–steroid preparation than with a polymyxin–neomycin–steroid combination. The adverse event rates are similar in both groups (Rahman et al, 2007).

Culture and sensitivity should be considered, particularly in patients who have already received treatment but have failed to respond.

A narrow ear canal may not facilitate topical treatment. It is often more helpful to gently insert a soft compressed otowick soaked with aqueous antibiotic–steroid ear drops in this situation. This sponge absorbs the drops and retains the medication locally. The wick should be replaced daily until the canal opens up. Oil-based ear preparations like Canesten, Locorten-Vioform and ichthammol-glycerin will not expand the otowick and are better used as ear drops or on ribbon gauze (Clamp, 2008). Otowick should be used with care as it can cause trauma. The resolution rate is similar whether wick or ribbon gauze is used in the treatment (Pond et al, 2002).

Topical antibiotic–steroid ear drops are based on an acidic solution which can cause burning on application, reducing the patient's compliance. Ophthalmic preparations are less acidic and may be better tolerated by these patients. They also have a low viscosity that can penetrate the narrow lumen (Bojrab et al, 1996).

Glycerol and ichthammol (90:10 v:v) is an inexpensive commonly used preparation. The glycerol in this preparation is hygroscopic, thus reducing canal oedema and pain, and antibacterial against streptococci and staphylococci (Ahmed et al, 1995). Glycerine and ichthammol-soaked ribbon gauze has been recommended as first-line treatment (Hornigold et al, 2008; Masood et al, 2008). Clinical improvement similar to that seen when antibiotic–steroid ear drops are used has been reported and soaked ribbon gauze use is recommended in patients with allergy to the carrier used in drops,

poor compliance or manual dexterity. Triamcinolone–gramicidin–nystatin–neomycin cream or ointment is particularly effective in chronic eczematous inflammation and may be applied with a syringe and cannula. Alternatively, the ear canal can be packed with ribbon gauze covered in the above medicine. The cream is best used when the ear canal is very wet and the ointments when relatively dry.

Ototoxicity

As long as the tympanic membrane is intact and the middle ear and mastoid are closed, topical aminoglycosides are safe and cannot be ototoxic. However, if the tympanic membrane is not known to be intact, ototoxicity is a potential risk (Roland et al, 2004b).

Both vestibular and/or cochlear toxicity have been described when neomycin or polymyxin B drops are used in patients with either tympanic perforations or open mastoid cavities (Matz et al, 2004). The risk is very low but drops that are potentially ototoxic must not be used for long periods.

Ototoxicity was described following experiments on rodents. Entry into the inner ear is assumed to be the result of diffusion across the round window membrane. However, in humans, the round window is normally covered by a 'false' second membrane. The membrane is also thicker than in rodents. The presence of inflamed granulation tissue in the round window niche is also thought to prevent access to the round window.

Fluoroquinolone topical drops are not ototoxic and are equally effective as aminoglycoside drops (Manolidis et al, 2004).

The following are the recommendations of the Consensus Panel of the Australian Society of Otolaryngology Head and Neck Surgery on ototoxic ear drops and tympanic membrane perforation (Black et al, 2007), which concur with American (Roland et al, 2004a) and British (Phillips et al, 2007) expert committee consensus:

1. Non-ototoxic eardrops are preferable in the presence of tympanic membrane perforations or grommets
2. If potentially ototoxic drops are used for discharging middle ears, they should be ceased immediately the infection resolves
3. The patient's or parental informed decision making should be documented for use of potentially ototoxic eardrops
4. If hearing loss, vertigo or tinnitus develops while using potentially ototoxic ear drops the patient should be instructed to return to his/her doctor
5. If the tympanic membrane is known to be intact and the middle ear and mastoid are closed, then the use of potentially ototoxic preparations presents no risk of ototoxic injury.

An ENT-UK consensus report recommends that when treating a patient with a discharging ear, in whom there is a perforation or patent grommet, a topical aminoglycoside should only be used in the presence of obvious infection. Topical aminoglycosides should be used for no longer than 2 weeks. The justification for using topical aminoglycosides should be explained to the patient. Baseline audiometry should be performed, if possible or practical, before treatment with topical aminoglycosides (Phillips et al, 2007).

There is no evidence in the literature to suggest development of significant antibiotic resistance from the use of topical antibiotic ear drops (Weber et al, 2004).

Systemic therapy

While most cases of external otitis are managed using topical therapy, systemic antibiotics are indicated when the infection is severe and cellulitis spreads beyond the ear, or if the patient is systemically unwell or immune compromised.

Prevention

The prevention of recurrent or chronic otitis externa can be achieved by advising the patient to avoid traumatizing the ear canal by inserting fingernails or any foreign objects into the ear. The ears should be kept dry. Ear plugs are useful when swimming or showering, and cotton wool covered with petroleum jelly is the most effective, inexpensive, comfortable and easiest way of waterproofing the ear (Chisholm et al, 2004). Topical acetic acid or 70% alcohol can be useful to re-establish an acidic environment.

Patients should keep their fingernails trimmed and maintain good hand hygiene. Allergy to cosmetics and metal earrings should be recognized and future contact discouraged. Hearing aid moulds should be cleaned regularly and removed when not in use or if infection recurs: a bone conduction hearing aid may be used as a temporary alternative. Hypoallergenic moulds should be considered in recurrent infection.

Surgical intervention

Surgery has a very limited role in the treatment of otitis externa, but may be indicated in managing external canal stenosis. A bone-anchored hearing aid fixed to an implanted titanium peg fitted behind the ear should be considered in susceptible patients who are reliant on aided hearing. **BJHM**

Conflict of interest: none.

KEY POINTS

- Otitis externa affects quality of life.
- It has either infective or non-infective causes.
- Pain and itching are the most common symptoms.
- Topical medication work better than systemic ones.
- Prevention is an important step in management.

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