Ear Wax and Its Removal: Current Practices and Recommendations

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Ear wax impaction is a ubiquitous problem. An estimated 2.3 million people in the United Kingdom (UK) each year suffer impaction significant enough to warrant intervention.[1] In the United States, approximately 150,000 wax removals are performed each week[2], and in 2012 the Centers for Medicare and Medicaid services spent $46.8 million in reimbursements for this procedure, predominantly to otolaryngologists in secondary care.[3] Despite UK recommendation for wax removal to take place in primary care[4], variable funding for such practice has led to ever-increasing referrals and waiting lists for removal in secondary care.[5]

This review summarizes the physiology and anatomy of ear wax, and reviews historical and current treatment options for managing wax impaction.

WHAT IS EAR WAX?

Ear wax is a composite material produced in the lateral one-third of the external auditory canal (EAC), comprising a mixture of desquamated keratin from skin cells sloughed off from the walls of the EAC, sebum from sebaceous glands and cerumen from ceruminous glands. It contains long-chain fatty acids, alcohols, squalene and cholesterol, and is usually unproblematic.[6,7] There are species difference in wax production, for example the ratio of sebaceous and ceruminous glands increases from medial to lateral in the dog, and aggregates of glands are found near the tympanic membrane in rodents.[8] The reasons for such species differences are not understood.

Despite being much maligned, the main function of ear wax is a protective one. It lubricates the walls of the EAC, trapping foreign particles and repelling water, and its acidic nature provides bactericidal and fungicidal properties.[6]

The physical properties of ear wax are genetically determined, particularly by polymorphism in the ABCC11 gene.[9] Those of Asian descent typically have 'dry' earwax that is brittle and lighter in colour. Those of African and White descent typically have darker and stickier 'wet' ear wax. Whether such variations alter risk of impaction is yet to be determined.[10]

EAR WAX IMPACTION

Ear wax naturally clears through migration of the epithelial cell lining of the EAC, aided by normal jaw movements. Where this process becomes disrupted or inadequate, wax may be retained[10] and is defined as impacted when accumulation in the ear canal becomes symptomatic or prevents assessment via otoscopy.[11]

Causes of impaction are not well researched, but clinical experience suggests several reasons, which may occur in isolation or combination. These include age-related changes, altered anatomy of the ear canal or meatus, altered skin physiology, foreign bodies, or instrumentation of the ear (Table 1). There may also be idiopathic overproduction of wax. One particular cause of wax impaction is following the operation "canal wall down mastoidectomy," where the posterior and superior bony ear canal is removed such that the mastoid bone of the middle ear becomes part of the outer ear, forming a mastoid cavity. The movement of wax within a mastoid cavity is often haphazard and incomplete[12,13], and many cavities need clearing of wax at variable intervals.[14,15] Another common cause of wax impaction is the use of hearing aids (and excessive use of earphones) obstructing normal migration and possibly causing overstimulation of ceruminous and sebaceous glands in the EAC leading to increased wax production. Further, wax can cause hearing aid damage.[16]

Symptoms of ear wax impaction include a sense of aural fullness or blockage, itching or mild irritation, and in some cases tinnitus and hearing loss.[10] It is important to consider other diagnoses in the presence of severe pain, significant hearing loss, or copious ear discharge.[17]

HISTORY

Manual methods of ear wax clearance have been in practice since the early ages. The "ear syringe" was mentioned in the 1st Century AD by Celsus for rinsing suppuration and clearing foreign bodies from the EAC, and gained popularity again in Europe in the 19th Century with development of bespoke syringes documented in Germany and Italy, and a kidney bowl to collect rinsing water from the ear.[18] Ear irrigation is now one of the most popular methods of wax clearance, with an estimated 4 million procedures performed annually in the UK alone.[19]

Instruments such as spoons and picks have been used for wax removal for at least two centuries both in Europe and Asia (Figure 1).[20-22] In Japan, the practice of "mimikaki" to remove wax using picks and hooks is still popular in contemporary culture, starting in early life where children sit in their mother's lap for regular cleaning of the ears[23] and with parlours specializing in this practice for adult clients.[20] Paid services for wax removal are found in other cultures, too, for example on the streets of Delhi, India.


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Table 1. Summary of Ear Wax Impaction Causes

Risk Factor	Presumed aetiology
Age > 50	Cerumen gland atrophy with age contributes to wax that is drier and harder to clear.[1]
Hirsute ear canal or meatus	Excessive or coarse hair in the ear canal increases risk of obstruction, particularly if it becomes matted. This is more common in older men.[1]
Ear canal anatomy	Narrow or tortuous ear canals impede wax clearance. This may occur in isolation, or as part of wider craniofacial malformation (e.g., narrow canals in Down syndrome). Ear canal pathology such as exostoses, osteomas, external canal cholesteatoma, or surgery such as canal wall-down mastoidectomy, can also impede wax clearance.
Ear meatus anatomy	A congenitally narrow meatus (entrance to the ear canal) may occur in isolation or in combination with a narrow ear canal. Acquired narrowing is particularly seen in elderly patients, where reduced tissue elasticity can lead to anterior prolapse of the conchal cartilage of the pinna.
Abnormal skin physiology	Dermatological conditions such as keratosis obturans, eczema, or psoriasis may alter wax physiology and clearance.
Foreign bodies in the ear canal or meatus	Regular use of earplugs, earphones, or hearing aids in the meatus may impede wax clearance. Foreign bodies in the ear canal, such as beads, or surgically placed grommets (that have extruded from the tympanic membrane) can also create a nidus for wax accumulation.
Instrumentation of the ear	Instrumentation, for example with cotton buds, picks, or sticks, may push wax into the deep ear canal where it can become impacted.

In modern times, objects such as cotton buds and hair pins, and trends such as ear-candling have gained popularity for the removal of earwax, although these remain cautioned by medical professionals and literature.[8,17,24] There has also been an explosion of cameras and instruments on sale to the public, to enable people to remove their own wax under visualization.

CURRENT PRACTICES

There is agreement among professional organizations, including NICE, Cochrane and the American Academy of Otolaryngology, that clinicians should only diagnose and treat ear wax impaction in patients where buildup is symptomatic and/or preventing adequate examination of the ear canal or drum.[11,25,26] However, clinical experience suggests some patients attend for wax removal frequently, and in some cases, due to habit or misconception (either on the part of the patient or the provider), rather than true clinical need.

Within the National Health System in the United Kingdom, it is a service offered at few primary care practices, due to a combination of lack of funding and training. In secondary care, ear wax removal may sometimes only be offered as part of a wider assessment, facilitating diagnosis, or as part of ongoing management of chronic pathology such as patients with mastoid cavities. In the United States, it is not a procedure covered by medical insurance unless necessary to enable full examination.[27] Consequently, there exists a wide range of paid-for ear wax removal services within the community, including high-street providers and mobile services.

Figure 1. Bronze ear scoop found in the Tiber, Sir Henry Wellcome's Museum Collection.[20]

Cerumenolytic agents. UK guidance advises first-line therapy with cerumenolytic agents to soften wax to aid removal. Examples include 3-4 drops of a water-based solution such as sodium bicarbonate 5% ear drops, off-label use of 0.9% sodium chloride nasal drops, or an oil-based compound such as olive or almond oil drops for up to five days.[5,25] Patients using ear drops should be made aware of rare adverse effects such as discomfort, irritation, dizziness and transient worsening or loss of hearing, and use is not recommended where there is suspected perforation of the tympanic membrane, active infection or suspected allergy to the agent (in such circumstances health professionals should refer to specialist ENT services for management[25]).

A recent Cochrane review found that five days application of active treatments (with agents described above) was superior in clearance of wax compared to no treatment (albeit with weak evidence). There was no high-quality evidence suggesting a particular agent was superior to another, that there was a difference in efficacy between oil and water-based compounds, nor that there was a difference in adverse effects between agents.[26] Other studies have reported no evidence that use for longer than five days improves clearance when compared with a shorter duration.[1,28]

Irrigation. Where symptoms persist despite use of cerumenolytic agents, ear irrigation may be considered, provided

there are no contraindications, and the patient is informed of potential adverse effects.[5,10,11,25] Contraindications include suspected or confirmed tympanic membrane perforation, history of previous perforation (due to risk of reperforation), patent grommets, presence of a mastoid cavity, recent ear surgery, concurrent infection or dermatitis, or obstruction of the ear canal by an organic foreign body (such as a pea or bean) as this could expand on contact with water.[10,11,25] Caution is advised in an only hearing ear, due to risk of causing hearing loss[5], or causing iatrogenic otitis externa, particularly in the elderly, immunocompromised, diabetic, or those with history of recurrent infection.[5,10,11,25] Finally, those agitated, confused, or unable to cooperate may be less suited to irrigation as there is potential increased risk of injury.[25]

Ear irrigation involves gentle flushing of ear wax from the canal with a syringe or electronic irrigator. Treatment with a cerumenolytic for the preceding five days (or failing that with an agent for 15-30 minutes prior to the procedure) improves success of irrigation.[26,28] With the patient sat upright and the pinna pulled supero-posteriorly to open and straighten the canal, the syringe tip or irrigator is inserted into the lateral one-third of the ear canal (and no deeper) and pointed in a supero-posterior direction, avoiding direct contact of the water stream on the tympanic membrane. The water should be close to body temperature to avoid caloric effects through stimulation of the vestibular system, potentially causing temporary vertigo and nausea.[6,10] An irrigation basin held tightly below the pinna catches water and wax as it flows out.[6] Otoscopy should be performed after the procedure to assess extent of wax clearance. If unsuccessful, irrigation may be repeated, with referral to ENT services in persistent cases.[25]

The risk of complication from ear irrigation has been estimated at 1 in 1,000[29], but a survey of UK general practitioners suggested complications were much more common, found in 38% of cases (105/274), who reported a total of 127 complications (Table 2).[29]

Certain practices may reduce complications. First, where manual syringe irrigation is undertaken, care should be taken to avoid high-pressure water angled directly towards the tympanic membrane, which could cause pain and trauma, including perforation[6] (reported rates of 0.2%-15%[29,30]). Other complications include infective otitis externa, perhaps caused by retained water in narrow or tortuous ear canals, damage to ear canal skin, or disruption of the normal antimicrobial properties of acidic earwax (reported rates of 3%-17%[29,31]). Re-acidification of the ear canal post-procedure with 2% acetic acid has been suggested, but in our experience is not widely practiced.[10,11]

Table 2. Breakdown of 127 Complications Reported by 105 Practitioners Using Ear Syringing

Complication	Number	%
Failure of wax removal	37/127	29%
Otitis externa	22/127	17%
Perforation of tympanic membrane	19/127	15%
Damage to external auditory canal	15/127	12%
Pain	10/127	8%
Vertigo	9/127	9%
Other	15/127	12%

(Adapted from Sharp et al.[26])

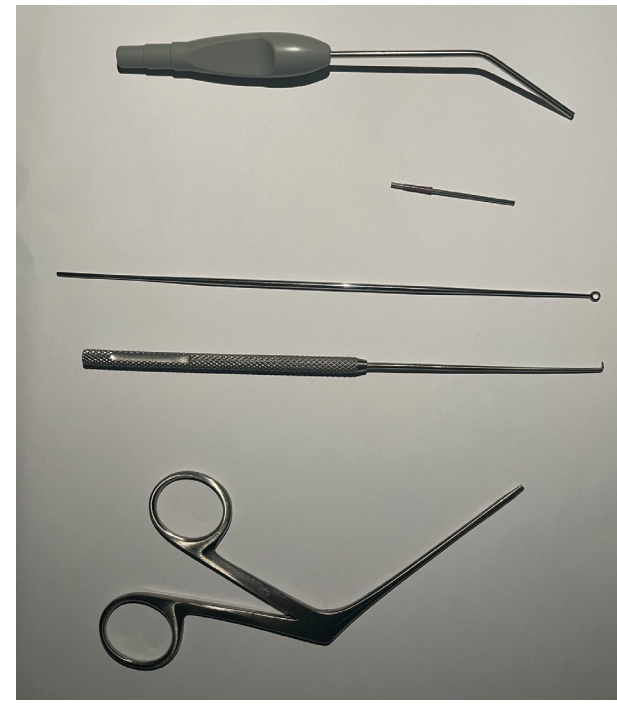

Figure 2. Commonly used instruments in manual wax removal (from top to bottom) – Zolner suction, fine suction end, Jobson-Horne probe, wax hook, crocodile forceps (Authors' own image).

Variation in reported rates of complications is likely to represent, in part, variation in practitioner experience and technique. Nevertheless, their frequency mandates that irrigation only be undertaken where clinically required, and by appropriately trained individuals.

Manual removal under vision. Manual removal techniques offer an alternative method of ear wax removal, particularly where cerumenolytic agents are ineffective or irrigation has failed or is contraindicated. Wax is removed under direct visualization under a binocular microscope, loupes or endoscopes, and any of a number of instruments. Commonly used tools (Figure 2) include wax hooks (useful for removing plugs of hard wax or solid foreign bodies), Jobson-Horne probes (useful for scooping and removing softer foreign bodies prone to breaking into smaller particles, such as silicone ear plugs or soft wax), crocodile forceps (for foreign bodies such as hearing aid components, paper, or tissue) and finally, suction (microsuction).[11]

The benefits of manual removal are that the procedure is under direct visualization and that instruments serve to pull the wax away from structures rather than pushing against them. Consequently, the risk of physical injury to the external

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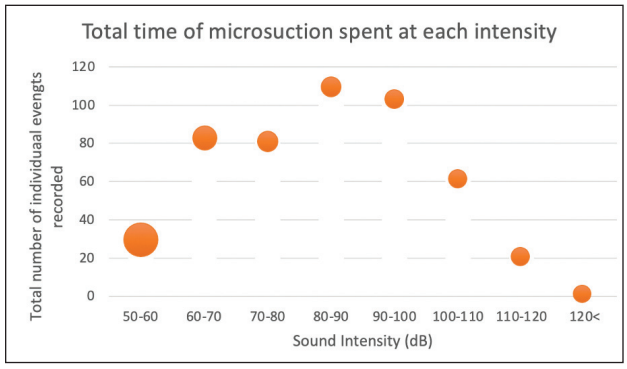

Figure 3. Number of events and total time spent at different sound intensity levels during microsuction in 25 ears. Area of the circle represents the relative time recorded at that sound intensity. Data extracted from Snelling, et al.[32]

ear canal or tympanic membrane is reduced, and complete clearance more reliably achieved and contemporaneously verified.[5,10,11] Magnified visualisation also allows easier diagnosis of anatomical or other abnormalities and manual removal is preferred in patients with conditions such as tortuous ear canals, or where irrigations would be cautioned or contraindicated such as tympanic membrane perforation, grommets, mastoid cavity, or those who have recently had ear surgery.[10,11]

Microsuction has been found to be particularly effective in removal of wax, with one study of 159 cases demonstrating 91% success in clearance[32], and another reporting higher rates of patient satisfaction with microsuction compared to usual care, irrigation or cerumenolytic agents.[33] However, one disadvantage of microsuction is that it can generate high noise levels[34,35], potentially causing acoustic trauma to the cochlea, leading to hearing loss or tinnitus during the procedure.[36] Patients should be counseled about this, although the risk of causing long-term reduced hearing thresholds or tinnitus is thought to be low.[11] Figure 3 depicts the proportional total time spent at different sound intensities during microsuction in a study by Snelling, et al.[35] Some patients may also temporarily become dizzy during microsuction (particularly if they have a mastoid cavity), which is a result of caloric effects from suction affecting fluid movement in the vestibular system.

Many primary care health facilities do not have access to the specialist equipment or training to undertake manual wax removal, which can result in large volumes of medical or self-referral to specialist services, both in the public and private sector (some of whom also provide home or community-based services). Removal of ear wax should only be undertaken by those with adequate training and expertise due to the risk of iatrogenic injury to the ear canal or tympanic membrane, risking pain and infection.[5,29] Equally, practitioners with less confidence or experience may be over-cautious, risking incomplete removal of wax, and persistent patient symptoms or early recurrence.

Treatment of underlying cause. Where there is an identifiable risk factor for wax impaction, additional treatment may help. This may be simply advising patients not to instrument their ear, or to trim hirsute ear canals. Using cerumenolytic drops intermittently to prevent wax impaction may also help, although the efficacy of such measures is unknown. Where there is eczema of the ear canal skin, steroid drops or ointments may improve skin physiology, and theoretically wax clearance.

Surgery may be indicated in select cases, for example to reshape altered ear canal anatomy, excise problematic exostoses, or revise or obliterate a mastoid cavity. For a narrow meatus, the operation of meatoplasty to widen the entrance is often successful in improving wax clearance[37], and may be performed under local anaesthetic, meaning that age or fitness for anaesthesia are not contraindications to intervention.

CONCLUSION

We present an overview of ear wax physiology, pathology, and a review of current practices of ear wax removal. While each practice demonstrates differing risks and benefits, microsuction or other methods of manual removal under direct vision seem to offer the best efficacy and lowest risk. Greater investment in equipment and training for primary or community practitioners will serve to maximize availability of this service.

References for this article can be found at http://bit.ly/HJcurrent.