

**CERUMEN: A WASTE OF HUMAN BUT GUARD OF AUDITORY**

Yatri R Shah\*<sup>1</sup>, Dhruvo Jyoti Sen<sup>2</sup>, Sanjay D Panchal<sup>2</sup>, Dharmendra S Prajapati<sup>2</sup>, Dilip R Chavda<sup>2</sup>, Arun N Borakhatariya<sup>2</sup>, Vipul J Jesani<sup>2</sup>, Jignesh B Patel<sup>2</sup> and Parimal M Prajapati<sup>3</sup>

<sup>1</sup>Shree H N Shukla Institute of Pharmaceutical Education & Research, Gujarat Technological University, Amargadh, Rajkot, Gujarat, India.

<sup>2</sup>Department of Pharmaceutical Chemistry, Shri Sarvajani Pharmacy College, Gujarat Technological University, Mehsana, Gujarat, India.

<sup>3</sup>I K Patel College of Pharmaceutical Education & Research, Samarth Campus, Himmatnagar, Sabarkantha, Gujarat, India.

Received: 28 January 2011; Revised: 20 March 2011; Accepted: 24 March 2011; Available online: 5 April 2011

**ABSTRACT**

Earwax medically referred to as cerumen, is produced by glands in the outer ear canal. Its purpose is to trap dust and other small particles and prevent them from reaching and potentially damaging the eardrum. Normally, the wax dries up and falls out of the ear, along with any trapped dust or debris. Blockage or impaction of earwax occurs when the wax gets pushed deep within the ear canal. Earwax blockage affects about 6% of people and is the most common ear problem doctors see. Perforated eardrum, Middle-ear infection, External-ear infection (swimmer's ear), Permanent hearing loss from acoustic trauma are the complications associated with blockage of earwax. Earwax blockage can be prevented by avoiding the use of cotton-tipped swabs or Q-tips and other objects that push the wax deeper into the ear canal. A study has also suggested that ear wax may be prevented by application of a topical emollient.

**Keywords:** earwax, cerumen, impacted wax, ear candling, earwax removal, ear wax removal.

**INTRODUCTION**

Earwax, also known by the medical term *cerumen*, is a yellowish waxy substance secreted in the ear canal of humans and other mammals. It protects the skin of the human ear canal, assists in cleaning and lubrication, and also provides some protection from bacteria, fungi, insects and water.<sup>1</sup> Excess or impacted cerumen can press against the eardrum and/or occlude the external auditory canal and impair hearing. The most common cause of this is the use of Q-tips in the ear canal (and other objects such as bobby pins and rolled napkin corners), which pushes the wax deeper into the ear canal. Hearing aid and earplug users are also more prone to earwax blockage.

**When to go to the doctor:** If at-home removal of earwax is unsuccessful, If you suspect you have a perforated eardrum (recent ear infection, injury, loud noise, or pressure change from scuba diving), If you develop drainage from your ear, If you experience severe pain, fever, or continuing hearing loss.

**When to go to the hospital:** If you have a severe spinning sensation, loss of balance, or inability to walk, If you have persistent vomiting or high fever, If you have a sudden loss of hearing.

**Earwax Diagnosis:** A doctor can diagnose earwax blockage (or eardrum perforation) by listening to the patient's symptoms and then looking into the ear with an otoscope (ear-scope).

**Earwax Prevention:** Individuals with hearing aids should be routinely examined for earwax impaction (cerumen

impaction) every 3 to 6 months.

**Earwax Treatment**

**Selfcare and Home Remedies:** The patient may try a few earwax removal methods at home unless they have a perforation (hole) or tubes in the eardrum. Over-the-counter wax softening drops, for example, carbamide peroxide (Debrox, Auro, Murine) or warmed mineral oil may be put into the affected ear and then allowed to drain out after about five minutes. A bulb-type syringe may be used to gently flush the ear with warm water. Ear-Clear is a warm-water irrigation device that is available online. It is very important not to use forced water, for example, a Water Pik, because this may cause damage to the eardrum.

**Ear candling is not recommended:** Ear candles are hollow cones made of paraffin and beeswax with cloth on the tapered end. The tapered end is placed inside the ear, and an assistant lights the other end, while making sure your hair does not catch on fire. In theory, as the flame burns, a vacuum is created, which draws the wax out of the ear. Limited clinical trials, however, showed that no vacuum was created, and no wax was removed. Furthermore, this practice may result in serious injury.

**Earwax Medical Treatment:** The doctor may remove the earwax with a small plastic spoon called a curette, or by irrigating the ear with warmed water, saline, docusate (Colace), sodium bicarbonate, or other prescription-strength eardrops.

**PRODUCTION, COMPOSITION AND TYPES**

Cerumen is produced in the outer third of the cartilaginous portion of the human ear canal. It is a mixture of viscous secretions from sebaceous glands and less-viscous ones from modified apocrine sweat glands.<sup>2</sup> The primary

**\*Corresponding Author:**

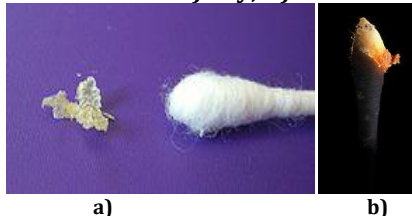
Yatri R Shah

Shree H N Shukla Institute of Pharmaceutical Education & Research, Gujarat Technological University, Amargadh, Rajkot, Gujarat, India.

Contact no: +91-9979132823; Email: [mydream.yatri@gmail.com](mailto:mydream.yatri@gmail.com)

components of earwax are the final products in the HMG-CoA reductase pathway, namely, squalene, lanosterol, and cholesterol. There are two distinct genetically determined types of earwax: the wet type, which is dominant, and the dry type, which is recessive. Asians and Native Americans are more likely to have the dry type of cerumen (grey and flaky), whereas Caucasians and Africans are more likely to have the wet type. Wet-type earwax fluoresces weakly under ultraviolet light. The primary components of earwax are shed layers of skin, with 60% of the earwax consisting of keratin, 12–20% saturated and unsaturated long-chain fatty acids, alcohols, squalene and 6–9% cholesterol.<sup>3</sup>

**Figure 1. Human earwax a) dry; b) wet**



Fear, stress and anxiety result in increased production of earwax from the ceruminous glands.<sup>4,5</sup> There are two distinct genetically determined types of earwax: the wet type, which is dominant, and the dry type, which is recessive. East Asians and Native Americans are more likely to have the dry type of cerumen (grey and flaky), whereas Caucasians and Africans are more likely to have the wet type (honey-brown to dark-brown and moist).<sup>6</sup> Cerumen type has been used by anthropologists to track human migratory patterns, such as those of the Inuit.<sup>7</sup> Wet-type of earwax is dominant in Ainu of Japan, in contrast to Japanese people.<sup>8</sup> The consistency of wet type earwax is due to the higher concentration of lipid and pigment granules (50% lipid) in the substance than the dry type (30% lipid).<sup>9</sup> The difference in cerumen type has been tracked to a single base change (a single nucleotide polymorphism) in a gene known as "ATP-binding cassette C11 gene." In addition to affecting cerumen type, this mutation also reduces sweat production. The researchers conjecture that the reduction in sweat was beneficial to the ancestors of East Asians and Native Americans who are thought to have lived in cold climates.<sup>10</sup>

## FUNCTIONS OF THE EARWAX

Ear wax is a normal product of the ear which protects the skin of the ear from water and infection. Ear wax is formed from wax glands in the external ear canal as well as other components such as dead skin, sweat, and oil. The primary component of ear wax is keratin (derived from dead skin). Ear wax thus differs slightly from *cerumen* which is the secretory product of the ceruminous glands in the external auditory canal. Different individuals vary considerably in the amount and consistency of their ear wax. There are two types described, wet and dry, which are inherited. Dry wax is common in Asia, while wet wax is common in Western Europe. Dry wax, also known as "rice-bran wax", contains by weight about 20% lipid (fat). Oddly enough, rice-bran wax is associated with a lower incidence of breast cancer. Wet wax consists of approximately 50% lipid. Wet wax can be either soft or hard, the hard wax being more likely to be impacted. While ear wax is generally simply felt to be a nuisance, in medieval times, ear wax was used as a component of pigment for illumination of manuscripts (Petraakis et al). Too little ear wax increases the risk of infection (Fairey et al).<sup>11</sup> Too much wax also increases the incidence of infection and hearing loss. So, you want just enough. While we are not

aware, some people (and some ears) are "wax producers", and others remain wax free without much maintenance.

**Cleaning:** Cleaning of the ear canal occurs as a result of the "conveyor belt" process of epithelial migration, aided by jaw movement.<sup>12</sup> Cells formed in the centre of the tympanic membrane migrate outwards from the umbo (at a rate comparable to that of fingernail growth) to the walls of the ear canal, and move towards the entrance of the ear canal. The cerumen in the canal is also carried outwards, taking with it any dirt, dust, and particulate matter that may have gathered in the canal. Jaw movement assists this process by dislodging debris attached to the walls of the ear canal, increasing the likelihood of its expulsion.

**Lubrication:** Lubrication prevents desiccation, itching, and burning of the skin within the ear canal (known as *asteatosis*). The lubricative properties arise from the high lipid content of the sebum produced by the sebaceous glands. In wet-type cerumen at least, these lipids include cholesterol, squalene, and many long-chain fatty acids and alcohols.<sup>13,14</sup>

**Antibacterial and antifungal effects:** While studies conducted up until the 1960s found little evidence supporting antibacterial activity for cerumen, more recent studies have found that cerumen has a bactericidal effect on some strains of bacteria. Cerumen has been found to reduce the viability of a wide range of bacteria, including *Haemophilus influenzae*, *Staphylococcus aureus*, and many variants of *Escherichia coli*, sometimes by as much as 99%.<sup>15-17</sup> The growth of two fungi commonly present in otomycosis was also significantly inhibited by human cerumen.<sup>18</sup> These antimicrobial properties are due principally to the presence of saturated fatty acids, lysozyme and, especially, to the slight acidity of cerumen (pH typically around 6.1 in normal individuals).<sup>19</sup>

## EAR WAX MAINTENANCE

First, one should realize that wax isn't all that bad. It keeps your ear dry and helps prevent infection. So, you don't want to eliminate wax, but just keep it from blocking your ear. How can one keep wax from blocking the ear? There are several methods. One method is to put *baby oil* or *olive oil* into the ear on a regular basis. Put in the drops; let it sit in there for a few minutes, then lie down on a towel to let it drip out again. Probably only a few drops every week in each ear is good enough (nobody has done a research study on this). It doesn't hurt to put a few drops of clean olive oil or baby oil into each ear every day. Swimmers often do this prior to their daily swim. However, be sure that the oil is clean, as you don't want to introduce bacteria. This should not be done if you have an eardrum perforation or if you don't know whether or not you have a perforation. Another method is to have your ear cleaned out by your doctor on a regular basis. Everyone builds up wax at their own rate, but commonly people need to come back for wax removal at 6 month or 1 year intervals. We recommend against using cotton tipped applicators (the so-called 'Q' TIPS) as well as putting other things into your ear such as hair pins. This can be dangerous because you run the risk of breaking your ear drum ("perforation"), as well as jamming wax deeper inside.<sup>17,20</sup>

## USES

### Historical uses for earwax

- In medieval times earwax, and other substances such as urine, were used to prepare pigments used by scribes to illustrate illuminated manuscripts.

- The 1832 edition of the *American Frugal Housewife* said that "nothing was better than earwax to prevent the painful effects resulting from a wound by a nail [or] skewer"; and also recommended earwax as a remedy for cracked lips.
- Before waxed thread was commonly available seamstresses would use their own earwax to stop the cut ends from fraying.

#### Modern uses

- Many types of whales have a build-up of earwax which increases with time; the size of the deposit is sometimes the only way to determine the age of whales that do not have teeth.
- In an episode of the television program *Myth Busters*, it was shown that candles made of human earwax can sustain a flame, but do not burn long or brightly enough to be as practical as paraffin or beeswax candles.

### TREATMENT

#### How does one know one has ear wax?

Direct vision is the easiest way. An otoscope is used to visualize the wax.

#### Figure 3. Otoscope (top) and Ophthalmoscope with handle (bottom)



#### Earwax Blockage Symptoms

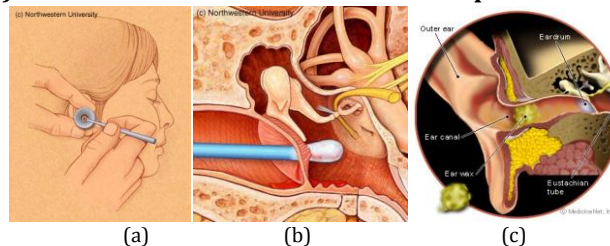
Earwax blockage can be associated with a number of symptoms including: decreased hearing, dizziness, ear pain, plugged or fullness sensation in the ear, and/or ringing in the ear.

#### What can go wrong with ear wax?

1. Wax can plug up the ear, causing hearing to be reduced, and a full feeling in the ear
2. Wax can trap bacteria in the ear, leading to infection. This is usually painful or at least itchy.
3. Ear wax can obscure vision when the doctor looks in your ears, possibly hiding a dangerous process.

Excessive cerumen may impede the passage of sound in the ear canal, causing conductive hearing loss. It is also estimated to be the cause of 60–80% of hearing aid faults.<sup>21</sup> Movement of the jaw helps the ears' natural cleaning process. Softening the earwax with warm olive oil or about 6.5% carbamide peroxide solution or some other agent will usually encourage the wax to soften up and assist it coming out, with the help of a syringe and warm water irrigating the ear canal after the solution has had the opportunity to soften the wax.<sup>22</sup> If this is not sufficient, the most common method of cerumen removal by general practitioners is syringing with warm water (used by 95% of GPs in Edinburgh).<sup>23</sup> A curette method is more likely to be used by otolaryngologists when the ear canal is partially occluded and the material is not adhering to the skin of the ear canal. Cotton swabs, on the other hand, push most of the earwax further into the ear canal and remove only a small portion of the top layer of wax that happens to adhere to the fibres of the swab.<sup>24</sup> In 2008, new guidelines were issued by the American Academy of Otolaryngology discouraging earwax removal unless excess earwax is causing health problems.<sup>25</sup>

#### Figure 4. (a) Wax removal under direct vision (b) Cotton tipped applicators used to clean out ear wax, there is a risk of breaking the ear drum (perforation) (c) Picture of the ear and earwax build-up



#### Cerumenolysis

This process is referred to as *cerumenolysis* and is achieved using a solution known as a cerumenolytic agent, which is introduced into the ear canal. It usually makes the wax come out, and if it doesn't, it facilitates removal by syringing or curettage. The technique was described by Aulus Cornelius Celsus in *De Medicina* in the first century.<sup>26</sup> When a man is becoming dull of hearing, which happens most often after prolonged headaches, in the first place, the ear itself should be inspected for there will be found either a crust such as comes upon the surface of ulcerations, or concretions of wax. If a crust, hot oil is poured in, or verdigris mixed with honey or leek juice or a little soda in honey wine. And when the crust has been separated from the ulceration, the ear is irrigated with tepid water, to make it easier for the crusts now disengaged to be withdrawn by the ear scoop. If it be wax, and if it be soft, it can be extracted in the same way by the ear scoop; but if hard, vinegar containing a little soda is introduced; and when the wax has softened, the ear is washed out and cleared as above. Further, the ear should be syringed with castoreum mixed with vinegar and laurel oil and the juice of young radish rind, or with cucumber juice, mixed with crushed rose leaves.<sup>11</sup> The dropping in of the juice of unripe grapes mixed with rose oil is also fairly efficacious against deafness. Commercially or commonly available cerumenolytics include:<sup>27</sup>

- Olive oil, almond oil, mineral oil, baby oil, and various other organic liquids (glycerol)
- Carbamide peroxide (6.5%) and glycerine
- A solution of sodium bicarbonate in water, or sodium bicarbonate B.P.C. (sodium bicarbonate and glycerine)
- Cerumol (arachis oil, turpentine and dichlorobenzene)
- Cerumenex (Triethanolamine, polypeptides and oleate-condensate)
- Exterol, Otex (UK brand name) (urea, hydrogen peroxide and glycerine)
- Docusate<sup>31</sup>, a detergent, an active ingredient found in laxatives

A cerumenolytic should be used 2–3 times daily for 3–5 days prior to the cerumen extraction.<sup>2</sup> A review of studies found that topical preparations for the treatment of earwax were better than no treatment and that there was little difference between oil based and water based preparations (including plain water).<sup>28,29</sup>

#### Mechanical Methods

**Syringing:** Once the cerumen has been softened, it may be removed from the ear canal by irrigation. Ear syringing techniques are described in great detail by Wilson & Roeser,<sup>24</sup> and Blake et al.,<sup>26</sup> who advise pulling the external ear up and back, and aiming the nozzle of the syringe slightly upwards and backwards so that the water flows as a cascade along the roof of the canal. The irrigation solution flows out of the canal along its floor, taking wax

and debris with it. The solution used to irrigate the ear canal is usually warm water,<sup>17</sup> normal saline,<sup>20</sup> sodium bicarbonate solution,<sup>30</sup> or a solution of water and vinegar to help prevent secondary infection.<sup>17</sup> Patients generally prefer the irrigation solution to be warmed to body temperature,<sup>20</sup> as dizziness is a common side effect of syringing with fluids that are colder or warmer than body temperature. Sharp et al.<sup>22</sup> recommend 37°C, while Blake et al.<sup>26</sup> recommend using water at 38°C, one degree above body temperature, and stress that this should be checked with a thermometer. Any other temperature may cause vertigo, just as used when testing the caloric reflex test. A syringe should be used to gently stream water into the ear. For children the rate and speed should be lower. After irrigating, the head is tipped to allow the water to drain. Irrigation may need to be repeated several times. If the water stream hurts, then the flow should be slower. It is better to irrigate too gently for a long period than irrigate too forcefully attempting to remove wax quickly. This procedure can be done at home in the shower using an ear irrigation syringe with a right angle tip. After the wax is removed, the ear can be dried by tipping the head and gently pulling the ear upwards to straighten the ear canal.

**Figure 2. Large sample of human earwax removed by irrigation (compared with dime)**



**Curette and swabs/ cotton buds:** Earwax can be removed with an ear pick/curette, which physically dislodges the earwax and scoops it out of the ear canal. In the west, use of ear picks is usually only done by health professionals; a modified curette having a safety stop to prevent deep insertion for self-use is available. Curetting earwax using an ear pick is common in East Asia. As the earwax of most East Asians is of the dry type,<sup>6</sup> it is extremely easily removed by light scraping with an ear pick, as it simply falls out in large pieces or dry flakes, often on its own. It is generally advised not to use cotton swabs (Q-Tips or cotton buds), as doing so will likely push the wax farther down the ear canal, and if used carelessly, perforate the eardrum. Abrasion of the ear canal, particularly after water has entered from swimming or bathing, can lead to ear infection. Also, the cotton head may fall off and become lodged in the ear canal. Cotton swabs should be used only to clean the external ear.

**Vacuuming:** Vacuuming of the ear may be done by professionals or by home-vacuum kits. However, a study in *Clinical otolaryngology* found that home "ear vacs" were ineffective at removing ear-wax, especially when compared to a Jobson-Horne probe. A postal survey of British general practitioners found that only 19% always performed cerumen removal themselves; many delegated the task to practice nurses, some of whom had received no instruction. It is problematic as the removal of cerumen is not without risk. Irrigation can be performed at home with proper equipment as long as the person is careful not to irrigate too hard. All other methods should only be carried out by individuals who have been sufficiently trained in the procedure. The author Bull advised physicians: *After removal of wax, inspect thoroughly to make sure none remains. This advice might seem superfluous, but is frequently ignored.* This was confirmed by Sharp et al.<sup>22</sup>

who, in a survey of 320 general practitioners, found that only 68% of doctors inspected the ear canal after syringing to check that the wax was removed. As a result, failure to remove the wax from the canal made up approximately 30% of the complications associated with the procedure. Other complications included otitis externa, pain, vertigo, tinnitus, and perforation of the ear drum. Based on this study, a rate of major complications in 1/1000 ears syringed was suggested.<sup>23</sup> Claims arising from ear syringing mishaps account for about 25% of the total claims received by New Zealand's Accident Compensation Corporation ENT Medical Misadventure Committee. While high, this is not surprising, as ear syringing is an extremely common procedure. Grossan suggested that approximately 150,000 ears are irrigated each week in the United States and about 40,000 per week in the United Kingdom. Extrapolating from data obtained in Edinburgh, Sharp et al.<sup>22</sup> place this figure much higher, estimating that approximately 7000 ears are syringed per 100,000 populations per annum. In the New Zealand claims mentioned above, perforation of the tympanic membrane was by far the most common injury resulting in significant disability.

**Ear candling:** Ear candling, also called *ear coning* or *thermal-auricular therapy*, is an alternative medicine practice claimed to improve general health and well-being by lighting one end of a hollow candle and placing the other end in the ear canal. According to medical researchers, it is both dangerous and ineffective. Advocates say that the dark residue that shows after the procedure is extracted earwax, proving the efficacy of the procedure. Studies have shown that in fact the same residue is left whether or not the candle (which is made of cotton fabric and beeswax and leaves a residue after burning) is inserted into an ear.

**The best way:** removal under direct vision by a doctor or other professional is the best method of getting wax out, but it requires a doctor's visit and the doctor must have access to a microscope. Practically speaking, this generally requires yearly visits to see a specialist called an "otologist". Over the counter drops that help remove wax are largely basically water, oil and peroxide solutions (e.g. brand names are Debrox or Murine). Among the solutions are ordinary water, 10% sodium bicarbonate, 3% hydrogen peroxide, 2% acetic acid, and a combination of 0.5% aluminum acetate and 0.03% benzethonium chloride. Hydrogen peroxide is present for the mechanical effect, it does not dissolve ear wax. These preparations are best for those with small to moderate amounts of wax. Among oil-based organic solutions are olive oil, glycerin, propylene glycol, and others.<sup>27</sup> Warming of solutions used for wax removal sometimes is helpful. According to Hawke, oil based preparations basically do nothing but lubricate. Some preparations are enzyme based. We advise against use of "enzyme" based preparations, such as Cerumenex, because of problems with allergy. **NONE OF THESE PREPARATIONS SHOULD BE USED IN PERSONS WHO HAVE A EARDRUM PERFORATION.** In many patients, a wax plug blocks the ear so one cannot know for sure if a perforation is present. However in this situation, it is usually possible to make an educated guess with a reasonable degree of reliability (Hawke, 2002). Irrigation or "syringing" is a standard method of wax removal and approximately 150,000 ears are irrigated each week in the United States (Grossan, 1998). While this is a conventional and accepted method of ear wax removal, it has many

disadvantages compared to removal under direct vision. For example, in the rare instances when there is a perforation, irrigation may force water and wax into the middle ear, causing a nidus for infection. Water jet devices such as used for dental care have also been used for ear wax removal. While generally effective, this method is judged unpleasant by many patients. There is also danger of perforation of the ear drum using these devices. Special tips can be used to reduce or eliminate this risk. "Candling" is an "alternative" method of removing wax. This method is not felt to be effective.<sup>2,28,29</sup>

## CERUMEN IMPACTION REMOVAL: TREATMENT & MEDICATION

Carbamide peroxide, also called urea peroxide, urea hydrogen peroxide (UHP), and percarbamide, an adduct of hydrogen peroxide and urea. Like hydrogen peroxide, it is an oxidizer. This compound is a white crystalline solid which dissolves in water to give free hydrogen peroxide; the solubility of commercial samples varies from 0.05 g/mL to more than 0.6 g/mL.

**Anesthesia:** Topical anesthetic drops have no documented benefits in ear wax removal. Local anesthetic injections into the ear, although effective, are particularly painful and are, therefore, not used.

**Equipment:** The techniques used in cerumen removal include microsuction, mechanical removal, and irrigation. Instruments are shown in the image below.

**Figure 5. Instruments for cerumen removal**



### Microsuction:

- Operating microscope with focal distance of approximately 200 mm and magnification of 4-25 times.
- Suction device capable of 300 mm Hg suction pressure, with a reservoir and built-in filter.
- Suction tips, various sizes, including 16 and 18 gauge (ga)
- Aural specula, various sizes
- Crocodile forceps, various sizes
- Wax hooks
- Jobson Horne probes, various sizes

### Mechanical removal:

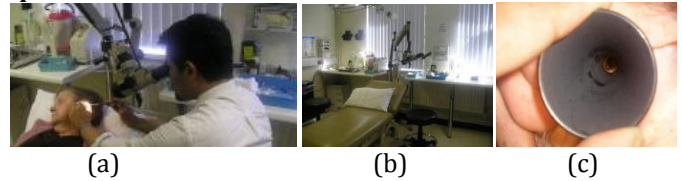
- Headlight, otoscope, or microscope (for visualization).
- Other equipment as listed above for microsuction.

**Positioning:** Patient positioning may vary according to individual clinician preference or may be dictated by anatomical limitations.

- Usually, the patient is semi-reclined. Although having the patient sitting upright saves positioning time, the attic region is difficult to access with the patient in this position.
- Positioning the patient supine with the head on a pillow simulates the operative view and allows good access to the external ear canal and tympanic membrane, including the attic. The supine position also aids patient stability. This is particularly beneficial if the patient experiences vertigo during the microsuction, as is often

the case after mastoidectomy. Patient positioning and room setup are shown in the images below.

**Figure 6. (a) Correct patient and care provider positioning is important and improves visualization of the external canal and tympanic membrane. (b) Room setup for cerumen removal. (c) View through an aural speculum.**



### Preparation and visual assessment:

- Assemble and prepare all necessary equipment.
- Take time to explain the procedure to the patient and obtain consent.
- Connect suction tip and turn on the suction machine and microscope light.
- Position the patient's head facing away from the operator, the neck flexed laterally and the shoulder pulled down.
- Examine the pinna, outer portions of the external canal, and the adjacent scalp for any evidence of previous surgery incision scars, signs of infection, or discharge.
- Inspect the outer ear canal opening, using the appropriate aural speculum, as shown below.
- The speculum should be the largest size that fits. It should be placed deep enough to clear the hair-bearing skin but not deeper, as unnecessary pain may result.
- The speculum should be held with the first and second fingers. Use the other fingers to retract the pinna up and backward in an adult (retract the pinna up and downward in a child).
- Assess the cerumen. Gently probe with a blunt instrument such as Jobson Horne curette to determine whether the cerumen is soft, hard, or bony hard.
- Assess whether tympanic membrane is visible. Look for any air spaces around the cerumen.
- Before beginning the cerumen removal, ensure that the microscope and operator are optimally positioned. The microscope should be positioned to provide the optimal view of the ear canal, and the operator should be sitting comfortably and with a straight back.

### Technique:

- If space permits, use an instrument to remove the wax. A ring probe (Jobson Horne curette) may be used to scoop the wax out; experienced practitioners may prefer to use a wax hook. If the cerumen is of a harder consistency, attempt to push the wax away from the ear canal walls toward the middle and then pull it out with a crocodile forceps.
- If the wax is occlusive, use the large-bore suction (16 or 18 ga) device to remove the wax piecemeal. As soon as the hair-bearing skin is passed, downsize the suction device to 20 ga or larger. As experience grows, one develops a sense of the depth of the tympanic membrane, which allows for safe use of the large-bore sucker closer to the tympanic membrane. But suctioning on the tympanic membrane with a large-bore risks causing a perforation and significant discomfort to the patient and should be avoided.
- Once the cerumen is cleared, reposition the microscope. This may reveal additional cerumen or pathology, especially in the anterior recess or the attic area or if a mastoid cavity is present.

- If the patient reports discomfort during the procedure, postpone the cerumen removal for 2 or more weeks and encourage the patient to instill ear drops such as sodium bicarbonate (5%) ear drops twice daily. Such drops soften the cerumen and make it easier to remove.

#### Precautions:

- Try to stick to the anterior wall while clearing the canal. At the anterior wall, the angle with the tympanic membrane is more acute, and the transition to the tympanic membrane is less likely to be missed.
- Ask the patient to report pain, as this is a safety net. Pain is likely due to trauma to the ear canal skin.<sup>32</sup> However, touching the malleus can cause pain and is to be avoided. A very stoic patient may try to grin and bear the pain when the malleus is accidentally touched; if he or she does so, this warning sign may be missed.
- Do not hesitate to postpone the cerumen removal for 2 weeks, as pain and time can be saved by softening the cerumen with drops first. Drops can be selected at the clinician's individual preference, as reviews have failed to demonstrate significant differences between various drops. In 2009, a review of completed trials also failed to demonstrate a significant difference between using water or commercially available drops.
- Take special care with pediatric patients. Carefully explaining the procedure, allowing the child to touch the suction device, and introducing suction into the ear canal slowly may help children as young as 4 years to tolerate a microsuction session. However, most children only tolerate this procedure at age 8 years or older. Using a Jobson Horne probe or a ring curette may be a viable alternative in pediatric patients who do not tolerate microsuction.
- Adjust to the individual patient's needs. Meticulous cleaning is required in patients with otitis externa, but less so if they are having a mold made for a hearing aid. However, for patients who simply present with excessive wax buildup, the clinician only needs to remove most of the cerumen, and the rest can be cleared

#### REFERENCES

1. Alvord L S, Farmer B L; "Anatomy and orientation of the human external ear". *Journal of the American Academy of Audiology*. 1997; 8 (6): 383-90.
2. Grossan M; Cerumen Removal--Current Challenges. *ENT journal*. 1998; 77(7): 541-548.
3. Hawke M; Update on cerumen and ceruminolytics. *ENT journal, Supplement*. 2002; 1: 23-24.
4. Petrakis N L; Earmarks of Art History: Cerumen and Medieval Art. *Am. J. Otol* 2000; 21: 5-8.
5. Burkhart C N; In pursuit of ceruminolytic agents: a study of ear wax composition. *Am J Otol* 2000; 21: 157-160.
6. Fairey A, Freer C B, Machin D; Ear wax and otitis media in children. *Br Med J. Clin Res* 1985; Ed 291: 387-8.
7. Guest J F, Greener M J, Robinson A C, Smith A F; "Impacted cerumen: composition, production, epidemiology and management". August 2004; *QJM* 97 (8): 477-88.
8. Nicol Maggie, Brooker Christine; *Nursing adults: the practice of caring*. St. Louis: Mosby. 2003; p. 376.
9. Bass E J, Jackson J F; "Cerumen types in Eskimos". *American Journal of Physical Anthropology*. 1977; 47 (2): 209-10.

with weekly olive oil drops.

- If visual inspection reveals a foreign body instead of or in addition to cerumen, removal of the foreign body may require different techniques. See eMedicine article Foreign Body Removal, Ear for more information.
- A 0-degree rigid endoscope may be quicker and easier to access than a microscope when visualizing the cerumen, ear canal, and tympanic membrane.

#### Complications:

- Most patients tolerate the procedure very well with no analgesia. A minority of patients experience a mild amount of discomfort or even pain.
- Some patients experience short-term vertigo.
- Because of the noise generated by the suction tip, tinnitus may be worsened in some patients. Suction should be limited or avoided in patients with symptomatic tinnitus.
- Hard cerumen, probes, specula, and suction devices may all cause lacerations to the ear canal skin. Minor bleeding and discomfort may result.
- Using a large-bore suction device close to the tympanic membrane may cause trauma to the tympanic membrane, including a perforation. Such trauma usually heals spontaneously over the following weeks.
- Inadvertent force to the ossicular chain may lead to conductive or sensorineural hearing loss.

#### CONCLUSION

Cerumen, commonly known as ear wax, is a hydrophobic protective covering in the ear canal. It acts to shield the skin of the external canal from water damage, infection, trauma, and foreign bodies. The biogenic wax of the ear (cerumen) is essential to buildup of layers of earwax within the ear canal to the point of blocking the canal and putting pressure on the eardrum. Accumulation of cerumen is usually asymptomatic but can occasionally cause bothersome symptoms, such as hearing loss and ear discomfort. This topic will focus on the indications and techniques for cerumen removal.

10. Yoshiura K, Kinoshita A, Ishida T et al; "A SNP in the ABCC11 gene is the determinant of human earwax type". *Nature Genetics*. 2006; 38 (3): 324-30.
11. Petrakis S B, Fairey T R, Ernst A A, Takakuwa K M, Letner C, Weiss S J; "Warmed versus room temperature saline solution for ear irrigation: a randomized clinical trial". *Annals of Emergency Medicine*. 1999; 34 (3): 347-350.
12. Alberti P W; "Epithelial migration on the tympanic membrane". *The Journal of Laryngology and Otology*. 1964; 78: 808-30.
13. Harvey D J; "Identification of long-chain fatty acids and alcohols from human cerumen by the use of picolinyl and nicotinate esters". *Biomedical & Environmental Mass Spectrometry*. 1989; 18 (9): 719-23.
14. Bortz J T, Wertz P W, Downing D T; "Composition of cerumen lipids". *Journal of the American Academy of Dermatology*. 1990; 23 (5 Pt 1): 845-849.
15. Nichols A C, Perry E T; "Studies on the growth of bacteria in the human ear canal". *The Journal of Investigative Dermatology*. 1956; 27 (3): 165-170.
16. Chai T J, Chai T C; "Bactericidal activity of cerumen". *Antimicrobial Agents and Chemotherapy*. 1980; 18 (4): 638-641.

17. Stone M, Fulghum R S; "Bactericidal activity of wet cerumen". The Annals of Otolaryngology, Rhinology, and Laryngology. 1984; 93 (2 Pt 1): 183-186.
18. Megarry S, Pett A, Scarlett A, Teh W, Zeigler E, Canter R J; "The activity against yeasts of human cerumen". The Journal of Laryngology and Otolaryngology. 1988; 102 (8): 671-672.
19. Roland P S, Marple B F; "Disorders of the external auditory canal". Journal of the American Academy of Audiology. 1997; 8 (6): 367-378.
20. Bøe R, Silvola J, Yang J, et al. "Human beta-defensin-1 mRNA is transcribed in tympanic membrane and adjacent auditory canal epithelium". Infection and Immunity. 1999; 67 (9): 4843-4846.
21. Oliveira R J; "The active ear canal". Journal of the American Academy of Audiology. 1997; 8 (6): 401-410.
22. Sharp J F, Wilson J A, Ross L, Barr-Hamilton R M; "Ear wax removal: a survey of current practice". BMJ 1990; 301 (6763): 1251-1253.
23. Fraser J G; "The efficacy of wax solvents: in vitro studies and a clinical trial". The Journal of Laryngology and Otolaryngology. 1970; 84 (10): 1055-1064.
24. Wilson P L, Roeser R J; "Cerumen management: professional issues and techniques". Journal of the American Academy of Audiology. 1997; 8 (6): 421-430.
25. Hand C, Harvey I; "The effectiveness of topical preparations for the treatment of earwax: a systematic review". The British Journal of General Practice. 2008; 54 (508): 862-867.
26. Blake P, Matthews R, Hornibrook J; "When not to syringe an ear". The New Zealand Medical Journal. 1998; 111 (1077): 422-424.
27. Leong A C, Aldren C; "A non-randomized comparison of earwax removal with a 'do-it-yourself' ear vacuum kit and a Jobson-Horne probe". Clinical Otolaryngology. 2005; 30 (4): 320-333.
28. Seely D R, Quigley S M, Langman A W; "Ear candles--efficacy and safety". The Laryngoscope. 1996; 106 (10): 1226-1229.
29. Roeser R J, Ballachanda B B; "Physiology, pathophysiology, and anthropology/epidemiology of human ear canal secretions". Journal of the American Academy of Audiology. 1997; 8 (6): 391-400.
30. Ernst E; Ear candles: a triumph of ignorance over science. J Laryngol. 2004; 118(1): 1-2.
31. Whatley V N, Dodds C L, Paul R I; Randomized clinical trial of docusate, triethanolamine polypeptide, and irrigation in cerumen removal in children. Arch Pediatr Adolesc Med. 2003; 157(12): 1181-1183.
32. Saloranta K, Westermarck T; Prevention of cerumen impaction by treatment of outer ear canal skin. A pilot randomized controlled study. Clin Otolaryngol. 2005; 30(2):112-114.