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Cerumen Impaction: An Unnoticed Issue

Devasurya M[1], Priya R[2], Mahalakshmi Sundarapandian[1]*

[1]Division of Biotechnology, JSS School of Life Sciences (Ooty Campus), JSS Academy of Higher Education and Research, The Nilgiris, Tamil Nadu, India

[2]School of Agricultural Sciences, Amrita Vidya Vishwapeetham, Coimbatore, Tamil Nadu, India

ABSTRACT

Cerumen is an important component of ear health and offers protection to the sensitive ear structures, despite its modest size and often disregarded nature. A naturally occurring material created by glands in the ear canal is called cerumen, or earwax. Cerumen is a serious condition, yet it is frequently misunderstood, which results in incorrect management techniques and misconceptions. With an emphasis on its composition, functions, clinical significance, and therapeutic approaches, this review seeks to clarify the myriad facets of cerumen and also to improve our knowledge of cerumen and its significance for ear health by carefully analyzing the body of research and literature that has already been published.

KEYWORDS – Ear wax, cerumen, hearing impairment, antibacterial, antifungal

INTRODUCTION

Cerumen, or earwax, is a naturally occurring material found in the external auditory canal. The term "cerumen," which comes from the Latin word "cera," which means wax, describes the waxy material that the ear canal's ceruminous glands create. It is hydrophobia and is responsible for lubricating, cleaning, and is a protective material that shields the auditory canal's membrane from microbes and mechanical stress (Roser & Ballachanda, 1997). Changes in cerumen can indicate illness and are often linked to skin conditions. Wet cerumen is more common. Although cerumen is frequently thought of as an annoyance, it actually performs a number of vital tasks in the ear (Roland et al., 2008). Ear wax can be a sign of both widespread and local illness. Changes in the cerumen are linked to skin conditions. An example of this is the outer ear infection tinea vesicolor. More prevalent in those who have wet cerumen (Ono et al., 1981). It can lead to the emergence of symptoms, such as hearing impairment, tinnitus, feeling stuffed sensation, itchiness, otalgia, discharge, odor, or cough (Marchisio et al., 2016). For both the patient and the physician, getting rid of ear wax and then having better hearing can be one of the most fulfilling professional experiences (Hanger & Mulley, 1992). Numerous research from the past have examined the connection between emotional and stress weariness and hearing issues (Hasson et al., 2011). Despite its importance, it is often misunderstood, leading to incorrect management techniques and misconceptions. This review aims to improve our understanding of cerumen and its role in ear health. Treatment is often safe and efficient, but comorbidities can complicate it.

CERUMEN SECRETION

Cerumen is composed of sloughed epithelial cells and secretions, such as sebum and secretions from modified apocrine sweat glands. Under physiological circumstances, a self-cleaning mechanism that is aided by jaw motions regularly discharges cerumen, forcing it to migrate out of the ear canal (Alberti, 1964). Failure of this process results in too much impaction of cerumen, which may hinder evaluation of the ear canal/tympanic membrane, the audio vestibular system, or both. It is ensured that safe and efficient treatment is given by being aware of the various cerumen removal treatments that are accessible as well as their contraindications. Impaction is usually benign, however patient comorbidities can make treatment more difficult. Considering this, most occurrences of cerumen impaction can be safely and successfully treated in a primary care environment. When affected cerumen cannot be safely removed in basic care, otolaryngology—head and neck surgery—should be consulted (Horton et al., 2020).

CAUSES:

Acute upper respiratory infections, which are common in younger children, may aggravate when acute otitis media (AOM) and otitis media with effusion occur (Tasnee et al., 2015). (AOM is nothing but the infection in the middle ear). Children may rarely experience chronic suppurative otitis externa or media. A proper diagnosis and treatment strategy in each of these clinical disorders requires a precise image and examination of the tympanic membrane (Marchisio et al., 2016). Unfortunately, there are only a few, mostly out-of-date, and patient-limited studies that evaluate the prevalence of cerumen in children with these conditions (Jensen & Lous, 1999; Legnos et al., 2008). Additionally, very little is known about pediatricians' opinions regarding the removal of cerumen, and it is unclear if they often diagnose and manage ear issues based primarily on speculation rather than solid evidence. The advancement of diagnostic and treatment methods for pediatric ear disorders depends on this knowledge (Marchisio et al., 2016). Individuals experiencing cerumen impaction may exhibit symptoms such as tinnitus, otitis externa, ear pain, auditory fullness, and hearing loss (De Wesse & Saunders, 1968). A dysfunctional or insufficient natural elimination process leads to a symptomatic build-up of cerumen (Jabor & Amedee, 1997; Hanger & Mulley, 1992; Petrakis et al., 1986).

PHYSIOLOGICAL FACTORS

The likelihood of cerumen impaction can be affected by a number of physiological parameters that impact cerumen production and clearance. Hormonal oscillations, inheritance, and age-associated shifts in cerumen consistency and substance can all lead to cerumen impaction (Roland et al., 2008). Cerumen impaction will happen if the rate at which cerumen is produced outpaces the rate at which it migrates out of the ear. Idiopathic cerumen overproduction can occur in certain people with recurrent cerumen impaction (Mandour, 1974).

OBSTRUCTION

Cumulus can result from variations in the ear canal's anatomy. Cerumen migration may be impeded by benign bony growths in the ear canal called exostoses or osteomas. Patients who have experienced ear canal trauma or otitis externa in the past may be at risk for blockages due to soft tissue abnormalities. Lastly, some people may have ear canals that are exceptionally thin or curved, while others may have hair that prevents cerumen from being expelled. In the event that something is placed inside the ear canal, cerumen impaction may also happen. Cerumen is frequently driven further into the ear canal by cotton swabs, also known as Q-tips, and by the use of hearing aids and ear plugs (Jabor & Amedee, 1997; Horton et al., 2020).

GENETIC DETERMINANTS OF CERUMEN

The features of cerumen, such as consistency, color, and odor, are also influenced by genetic factors. The majority of Caucasians and African Americans possess the so-called 'wet' phenotype, characterized by wet, light, honey-colored cerumen that adheres to the auroscope. 'Dry' cerumen, on the other hand, is typically brittle, granular, and grey in mongoloid races (Hanger & Mulley, 1992; Hyslop, 1971; Bass & Jackson, 1977).

Individuals of East Asian heritage are more likely than those of European or African descent to have dry, flaky cerumen, according to studies that have linked genetic changes in the ABCC11 gene to variations in cerumen type (Yoshuira et al., 2006). The existence of these genetic variations may affect a person's vulnerability to illnesses connected to cerumen and the effectiveness of cerumen management techniques.

IMPACT OF CERUMEN ON HEARING HEALTH

The buildup of cerumen in the ear canal blocks the passage of sound waves, resulting in diminished auditory acuity. Cerumen impaction can have a substantial negative impact on hearing health, causing conductive hearing loss and affecting sound transmission to the middle ear (Schwartz et al., 2017). In order to restore auditory function and avoid long-term consequences, cerumen impaction must be promptly identified and managed.

CERUMEN PHENOTYPE

There are two genetically defined phenotypes of cerumen: "dry" and "wet." The "wet" cerumen subtype is more common in those of African and European ancestry, while the "dry" subtype is more common in those of Asian and Native American background (Matsunaga, 1967; Petrakis, 1969). The "dry" allele of the cerumen subtype is recessive and is inherited as a straightforward Mendelian characteristic (Michaudet & Malaty, 2018). A wet or dry cerumen phenotype has been suggested to either encourage or shield against cerumen impaction. The effectiveness of various cerumen removal methods has also been linked to this phenotype (Ping et al., 2017; Carr & Smith, 2001). Prior to recommending cerumen impaction therapy based on phenotype and establishing a strong correlation between cerumen phenotype and impaction rates, more research is required.

DIAGNOSIS

Cerumenolytic substances, irrigation with or without pretreatment with cerumenolytic agents, and manual removal are effective treatment methods (Michaudet & Malaty, 2018). Direct visualization using an otoscope is the method used to diagnose cerumen impaction. Typical signs and symptoms include tinnitus, coughing, itching, otalgia, hearing loss, and, in rare cases, an unbalance experience (Guest et al., 2004; Propst et al., 2012). Cerumen's potential impact on the diagnosis of acute otitis media was investigated in a study including 819 children aged one month to twelve years who either had an upper respiratory infection or were there for a well-child visit. Eleven cerumen impaction impeded the initial diagnosis of around 50% of children with acute otitis media. Compared to nearly all of the children evaluated by otolaryngologists, pediatricians removed cerumen in less than one-third of the children when a definitive diagnosis of acute otitis media was obtained (Marchisio et al., 2016).

MODIFYING FACTORS

The increased risk of bleeding in the external auditory canal following cerumen removal should be discussed with patients who have coagulopathies, hepatic failure, thrombocytopenia, hemophilia, or are using antiplatelet or anticoagulant drugs. When treating these individuals, clinicians should steer clear of traumatic irrigation or painful manual removal, or refer them to a subspecialist. Postprocedural otitis externa is more common in immunocompromised patients and people with uncontrolled diabetes mellitus, particularly when irrigation is used. There have been reports of malignant otitis externa, a potentially fatal external auditory canal infection that spreads quickly to the surrounding tissues and bones, when tap water irrigation is used. There have been reports of malignant otitis externa, a potentially fatal external auditory canal infection that spreads quickly to the surrounding tissues and bones, when tap water irrigation is used. Patients who are considered to be at-risk should be advised to seek urgent medical attention if they have fever, ear ache, or discharge after receiving irrigation (Driscoll et al., 1993; Rubin et al., 1990).

CERUMENOLYTIC AGENTS

Cerumenolytic drugs are often used to remove affected cerumen, either by themselves or in combination with irrigation or physical instrumentation. Three types of external remedies are available: water-based, oil-based, and non-water-or oil-based (McCarter et al., 2007; Rodgers, 2013). Even while ear drops are simple to administer and do not pose a danger of mechanical harm, some of them have the potential to irritate the ear canal or induce contact dermatitis. Physicians should confirm that the patient has never experienced any allergies to any of the ingredients. If there is a chance that the tympanic membrane is not intact, if a patent tympanostomy tube is present, or if the ear canal is diseased, ear drops should not be used. They should also be used at body temperature to prevent caloric effects (vertigo) (Schwartz et al., 2017; Michaudet & Malaty, 2018).

IRRIGATION

You can try irrigation both with and without a cerumenolytic pretreatment. It is crucial to have a thorough medical history, examine the external auditory canal and tympanic membrane, and make sure there are no anatomic anomalies, patent tympanostomy tubes, or ruptures in the membrane before beginning aural irrigation. Although none of the irrigation procedures employing syringes or electronic irrigators has been shown to be better, syringe irrigation done by hand is the most common method (Schwartz et al., 2017). The external auditory canal can be straightened with the use of gentle upward and downward traction on the external ear. To prevent injury, hemorrhaging, and discomfort, the water should be slowly infused and kept at body temperature. Periodically, the canal should be examined to make sure the cerumen has cleared and to rule out any potential problems including pain, a skin abrasion with or without bleeding, or an acute case of otitis externa. Severe problems including vertigo and rupture of the tympanic membrane are uncommon, happening about once every 1,000 syringes (Propst et al., 2012). A 50/50 solution of vinegar and isopropyl alcohol can be injected following treatment to lower the risk of infection (Driscoll et al., 1993; Pavlidis & Pickering, 2005). Because these devices promote cerumen production and disturb external migration, people who wear hearing aids should follow the cleaning instructions provided by the manufacturer and have ear canal exams every three to six months (Adams et al., 2008).

CERUMEN AND IMPLICATION OF HEALTH

Due to its internal secretion within the ear canal, cerumen is shielded from outside contamination, which poses a significant risk and reduces the diagnostic value of many biological samples. Even so, there are still some steps that need to be taken in order to maximize the reliability of the data that is obtained from its analysis. These include washing your hands, using disposable gloves and an apron, swabbing or removing cerumen from the inner part of your ear rather than the lobes, where soap or shampoo flakes are more common, transferring the sample to airtight vials or containers that are low-risk of cross-contamination, labeling the sample with patient information, and transporting it to the laboratory for analysis (Shokry & Antoniosi, 2017). The amount of time needed for sampling in order to get samples containing detectable amounts of casual cerumen varies. Typically, the subjects are told not to clean their ears for a week or ten days prior to sample collection, to bathe or shower with liquid soap or shampoo that is fragrance-free, and to avoid wearing any type of perfume or fragrance to prevent affecting the volatile composition of earwax. When collecting fresh cerumen samples, research participants' ears are first cleaned of any casual cerumen; then, they are irrigated with water and cotton swabs dampened with an alcoholether (3:1) mixture. After 24 or 48 hours, fresh cerumen is collected (Prokop et al., 2014).

MANUAL REMOVAL

In order to manually remove cerumen under direct view, instruments are used. In skilled hands, this cerumen removal technique is thought to be safe and effective, but in less experienced hands, it may cause harm. The American Academy of Otolaryngology–Head and Neck Surgery endorses manual cerumen removal as effective based on case series and professional opinion, despite the lack of supporting evidence (Schwartz et al., 2017). One benefit of hand removal is its speed and ability to keep the ear canal dry, which lowers the chance of infection.10 Patients with acquired or congenital ear problems, those who have recently undergone ear surgery, and those with impaired immune systems frequently prefer manual cerumen removal. When dealing with more complicated instances where irrigation or cerumenolytics run the danger of creating otitis media or where irrigation could puncture a weaker tympanic membrane, manual removal using an endoscope or binocular microscope allows for improved vision (Schwartz et al., 2017). Still, there are dangers associated with hand cerumen removal. Once cerumen is manually removed, there have been reports of tympanic membrane perforation, ear canal injuries, dizziness, and pain (Sharp et al., 1990). The tools needed for manual cerumen removal, such as binocular microscopes or micro suction equipment, which increase procedure comfort and safety, are frequently beyond of reach for family doctors in practice. Ten even said, general care physicians can still remove cerumen manually in the absence of these instruments, and in places where otolaryngology services are not easily accessible, this can be crucial. The primary factor in deciding whether to use manual cerumen removal is practitioner experience (McCarter et al., 2007).

ANTIBACTERIAL AND ANTIFUNGAL PROPERTIES IN HUMAN CERUMEN

Both gender disparity and significant age variations do not appear to be present in cerumen production. Still, the absence of notable variations across the course of the year may provide one line of indirect evidence against cerumen having a physiologically or clinically meaningful antibacterial function (Tomita et al., 2002). There are ongoing debates on the significance of human cerumen, despite the general consensus that it serves to shield the external ear canal from infections. Certain scientists have proposed that while cerumen is rich in nutrients, it cannot prevent infections; rather, it promotes the rapid growth of fungus and bacteria. In addition to acting as a physical barrier against infection, cerumen is thought to possess antifungal and antibacterial

qualities. Our research attempts to assess how human cerumen affects the growth of *Candida albicans*, *Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* (Lum et al., 2009). According to conventional wisdom, cerumen also shields the middle ear from fungus and germs. To strengthen host defenses against ear infections, for instance, some experts advise keeping the cerumen barrier in place (Lindsey, 1991). The evidence, however, appears to be somewhat weak for cerumen to have a clinically or physiologically relevant role in host defense. For example, if cerumen was crucial in supporting host defensive mechanisms, one may anticipate that its composition would change in the event of an infection. The antimicrobial elements of cerumen might be upregulated in response to bacterial exposure. However, it does not appear that otitis externa patients' cerumen contains more antimicrobial polyunsaturated fatty acids than those without the condition (Osborne & Baty, 1990). At various concentrations, cerumen reduced the growth of fungi and bacteria. The research showed that cerumen had antifungal and antibacterial qualities, which contribute to the external auditory canal's defense. It's interesting that few researchers demonstrated the antistaphylococcal, antimicrococcal, and antiherpes properties of certain species' in cerumen (Sokolov et al., 1995), it shows that the bactericidal activity of cerumen on *E. coli* (Stone & Fulghum, 1984; Chai & Chai, 1980; Baumann et al., 1961; Gupta et al., 2012).

ADVANTAGES OF CERUMEN

Protection: In order to exclude dust, debris, and other foreign objects from getting within the sensitive ear canal structures, cerumen serves as a barrier of defense.

Moisturization: Cerumen keeps the skin around the ear canal from drying up and getting irritating.

Antibacterial qualities: The antibacterial qualities of cerumen aid in preventing ear canal infections, therefore lowering the incidence of ear infections.

Self-cleaning: When the jaw moves during eating or other activities, cerumen is naturally forced out of the ear canal, aiding in the process of self-cleaning (Roland et al., 2008).

Acidic pH: Cerumen keeps the pH acidic, which inhibits the growth of some bacteria and fungi and further lowers the risk of infection (Baker et al., 2010).

Lubrication: Cerumen aids in lubricating the ear canal, which makes it easier for the jaw to move and less difficult for the structures inside the canal's skin to rub against one another (Roland & Blau, 2016).

Immunological function: The body's total immune response in the ear canal is aided by the immune cells and antibodies found in cerumen, which aid in the body's defense against infections (Minovi & Dazert, 2014).

MANAGEMENT OF IMPACTED CERUMEN

There are two techniques used in fundamental health care to eliminate affected cerumen: irrigation and curettage. Each method has advantages and disadvantages. A physician may watch the process when using a curette, and the shortage of water reduces the risk of infection. On the other hand, using a curette calls for a high level of competence (Freeman, 1995). On the contrary, irrigation is easier to use, uses less materials, and is less likely to harm the eardrum. Because of this, in primary care, irrigation is typically the recommended course of action for impacted cerumen (Guest et al., 2004).

Even with syringing, removing earwax is not always safe. Infections and water can enter the middle ear in patients who have perforated eardrums (Freemann, 1995). Moreover, leftover water might promote illness. Rarely, surgery is considered as an option.

In mild cases of impacted cerumen, softeners are frequently acceptable for treatment; in cases of greater severity, they can even avoid the need for surgical removal (Lyndon et al., 1992). Syringing can be combined with softeners.

CONCLUSION

Primary care can safely treat most cerumen impaction, but otolaryngology should be considered if it cannot be safely removed. When it fails to discharge, it impairs the ear canal, causing symptoms like hearing impairment, tinnitus, and otalgia. Acute upper respiratory infections, particularly in children, can exacerbate cerumen impaction. However, there are few studies on the prevalence of cerumen in children with these conditions, and little is known about pediatricians' opinions on cerumen removal. The composition and consistency of cerumen are influenced by genetic factors, with the 'wet' phenotype being common in Caucasians and African Americans, and 'dry' in mongoloid races.

Cerumen impaction is influenced by physiological factors such as hormonal oscillations, inheritance, and age-related changes in consistency and substance. Overproduction occurs when cerumen production outpaces migration, leading to idiopathic cerumen overproduction. Obstructs include variations in the ear canal's anatomy, exostoses or osteomas, ear canal trauma, thin or curved canals, hair, and obstructions like cotton swabs, hearing aids, and ear plugs. Cerumen, a substance found in the ear, is influenced by genetic factors, with East Asians more likely to have dry, flaky cerumen. This can affect vulnerability to cerumen-related illnesses and the effectiveness of cerumen management techniques.

Cerumen impaction can negatively impact hearing health, causing conductive hearing loss and affecting sound transmission. There are two genetically defined cerumen phenotypes: "wet" and "dry," with the "dry" subtype being more common in Asian and Native American backgrounds. Further research is needed to determine the effectiveness of cerumen removal methods. Cerumen impaction is a common condition affecting children aged one month to twelve years, causing symptoms like tinnitus, coughing, itching, otalgia, hearing loss, and unbalance experience. A study found that eleven cerumen impactions impeded the initial diagnosis of around 50% of children with acute otitis media.

Clinicians should avoid traumatic irrigation or painful manual removal in these patients. Postprocedural otitis externa is more common in immunocompromised patients and people with uncontrolled diabetes mellitus, especially when irrigation is used. Patients at-risk should seek urgent medical attention if they experience fever, ear ache, or discharge after irrigation. Cerumenolytic drugs are used to remove affected cerumen, either alone or in combination with irrigation or physical instrumentation.

There are three types of external remedies: water-based, oil-based, and non-water-or oil-based. Ear drops should not be used if the tympanic membrane is not intact, a patent tympanostomy tube is present, or the ear canal is diseased. Irrigation can be tried with or without a cerumenolytic pretreatment, but a thorough medical history and examination of the external auditory canal and tympanic membrane are crucial.

Syringe irrigation is the most common method, and a 50/50 solution of vinegar and isopropyl alcohol can be injected to lower infection risk. Cerumen, a secretion within the ear canal, is shielded from contamination, reducing its diagnostic value. To ensure data reliability, steps such as hand washing, disposable gloves, and

avoiding fragrance-free soap and shampoo are taken. Samples are then transferred to airtight containers, labeled, and transported to the lab for analysis. The time needed for sampling varies, and participants are advised not to clean their ears for a week or ten days. Fresh cerumen samples are collected after 24 or 48 hours. Manual cerumen removal is considered safe and effective in skilled hands, but less experienced hands may cause harm. However, manual removal can lead to tympanic membrane perforation, ear canal injuries, dizziness, and pain.

Tools like binocular microscopes or microsuction equipment are often beyond reach for family doctors. Practitioner experience is the primary factor in deciding whether to use manual cerumen removal. Human cerumen, a natural substance found in the ear canal, is believed to have antibacterial and antifungal properties. Despite its importance in protecting the ear from infections, some scientists argue that it promotes the growth of fungi and bacteria.

Irrigation is easier, less expensive, and less likely to harm the eardrum. Syringing is not always safe, and perforated eardrums can lead to infections and water. Softeners are often acceptable for mild cases and can avoid surgical removal.

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