



AN OBSERVATIONAL STUDY OF THE COMMON AEROBIC FLORA OF HUMAN CERUMEN IN GHAZIABAD AND ITS SURROUNDINGS - A CROSS-SECTIONAL STUDY"

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ABSTRACT

The temporal bone houses the structure commonly known as the ear. The ear is divided into three parts- the external ear, the middle ear and the inner ear. The external ear comprises of the auricle and the external auditory meatus (ear canal) which is further closed medially by the tympanic membrane. The human auditory canal is a wonderfully designed structure with self-cleansing properties whereby the cerumen migrates laterally and sloughs externally. Cerumen, or "earwax," is a wax like substance that lubricates the skin, preventing its desiccation, has antibacterial properties and may prevent intrusion of insects. The skin of the external auditory canal and auricle is predominantly occupied by Gram-positive over Gram-negative bacteria. The main Gram-positive bacteria are staphylococci, coryneforms, streptococci and enterococci, micrococci, and bacillus. Gram-negative species inhabit the auricle and skin of the external auditory meatus to a much lesser extent with *Pseudomonas aeruginosa* and *Moraxella osloensis* in relative abundance. A study has revealed that 48% patients had no growth, suggesting that there need not be an underlying bacterial or fungal infection to cause itching. All these patients had a dry canal skin without cerumen. This is attributed to a condition called ASTEATOSIS. Asteatosis is a common condition of the external auditory canal where the skin surface is dry and lacks cerumen. A knowledge of the bacterial flora of the human ear canal in health is essential in evaluating the possible etiologic significance of organisms cultured from the diseased canal.

KEYWORDS : CERUMEN, ASTEATOSIS, GRAM NEGATIVE FLORA, GRAM POSITIVE FLORA

INTRODUCTION:

The temporal bone houses the structure commonly known as the ear.^[1] The ear is divided into three parts- the external ear, the middle ear and the inner ear. The external ear comprises of the auricle and the external auditory meatus (ear canal) which is further closed medially by the tympanic membrane. The ear canal consists of an outer cartilaginous portion and an inner bony or osseous portion. The ear canal, which is rather straight early in life, assumes a definite "S" shape in adulthood that becomes more tortuous and narrowed in later life. Its length is approximately 2.5 cm superiorly and 3.0 cm inferiorly. The skin overlying the ear canal is approximately 0.2 mm thick in the osseous region but thicker in the cartilaginous region (0.5 - 1.0 mm).^[2]

The human auditory canal is a wonderfully designed structure with self-cleansing properties whereby the cerumen migrates laterally and sloughs externally. Cerumen, or "earwax," is a wax like substance that lubricates the skin, preventing its dessication, has antibacterial properties and may prevent intrusion of insects.^[3] Cerumen is a yellowish waxy substance secreted from specialized glands in the ear canal. Earwax is produced only in the outer one-third of the canal by a mixture of secretions of numerous sebaceous and deeper apocrine sweat glands. Ducts from these glands meet in the channel of the hair follicle through which they are transported to the skin surface.

Cerumen production is a consequence arising from a unique anatomical locale. The auditory canal is the only cul-de-sac of stratum corneum in the body. Therefore, physical erosion cannot routinely remove stratum corneum in the auditory canal. Cerumen offers a means to expel stratum corneum. Ceruminous and Sebaceous glands secrete cerumen which is composed of desquamated sheets of corneocytes, arising from the superficial and deep external auditory canal, along with glandular secretions. Sebaceous and Ceruminous glands secrete lipids and peptides into the cerumen. Hairs present in the external one-third of the canal also produce secretions that play a role in the composition of cerumen. The function of cerumen in protecting the ears against invasion of micro-organisms has been a subject of controversy for long. It has been suggested that cerumen is unable to prevent infection and that the nutrients of earwax support the growth of bacteria and fungi.

The skin of the external auditory canal and auricle is predominantly occupied by Gram-positive over Gram-negative bacteria. The main Gram-positive bacteria are staphylococci, coryneforms,

streptococci and enterococci, micrococci, and bacillus. Gram-negative species inhabit the auricle and skin of the external auditory meatus to a much lesser extent with *Pseudomonas aeruginosa* and *Moraxella osloensis* in relative abundance.

The skin and the cerumen present different microbial populations in the external ear. Gram-positive bacteria still dominate the bacterial flora and the species distribution is relatively similar to that in the skin. However, the Gram-negative bacteria species are less common in the cerumen than the canal and almost non-existent in the cerumen with *Pseudomonas* present. Interestingly, fungal microbes across the board are more common in cerumen than the canal with similar species distribution.

On the other hand, it has been suggested that cerumen might have anti microbial activity, although little evidence has been presented to support this contention. Cerumen forms an acidic coat in the prevention of external auditory canal infection. Absence of cerumen may lead to infection, therefore cerumen has an anti-microbial role by physically protecting the external auditory canal skin, establishing a low pH; thus an un-welcoming environment for pathogens and producing anti-microbial compounds such as lysozyme, so that its absence leaves the canal unguarded to infection. The conventional view holds that cerumen also protects the middle ear from bacteria and fungal infection. For example, some authorities suggest retaining the cerumen barrier to bolster host defences against ear infections. However, the evidence that cerumen plays a biologically or clinically significant role in host defence seems relatively weak.

It might be expected, for example, that if cerumen played an important role strengthening host defence systems, its composition would re-orient in response to an infection. Perhaps exposure to bacteria would induce up-regulation of anti-bacterial components of cerumen. However, the cerumen of patients with otitis externa does not seem to contain more anti-bacterial polyunsaturated fatty acids than those without. A study shows that the human cerumen has more anti-bacterial property as compared to anti-fungal property. Apparently, some protective mechanism in the fungus led to less inhibition of their growth as compared to the bacteria. Apart from being a physical barrier, cerumen acts as a protective coating over the external auditory canal due to its anti-bacterial and anti-fungal properties.

Hence, routine wax removal/ear cleaning is not mandatory unless impacted wax is leading to earache or conductive hearing loss. There

are two discrete forms of human cerumen:-

WET
DRY

Both wet and dry cerumen are associated with race and controlled by two autosomal alleles.^[4] Wet cerumen, which is light or dark brown or sticky, is characterized by a relative high concentration of lipid and pigment granules and is found predominantly in caucasian and negro population. Dry cerumen, which is grey or tan and brittle, tends to express lower levels of these components and is found predominantly in mongoloid populations of asia and in american indians. Dry wax contains around 20% lipid, compared to approximately 50% in wet cerumen.^[5] Keratin has accounted for upto 60% of the cerumen plug in patients with recurrent impacted earwax. Hard plugs contain more of keratin sheets than softer wax. In contrast, corneocytes in the softer wax seem to undergo expansion. Impacted cerumen often causes unpleasant symptoms and is occasionally associated with serious sequelae, including hearing loss, social withdrawal, poor work function and perforated eardrums. Cerumen production has not shown discordance between sexes. The clinical significance of the change in triglyceride levels, if any, remains unknown however, there is some evidence of genetic polymorphisms in cerumen phenotypes.

The cerumen function in protecting the ear against micro-organisms and may have antibacterial activities. Apart from allowing desquamation, cerumen cleans and lubricates the canal, trapping dirt and repelling water. As a result of the sebaceous gland's secretions, cerumen's organic composition comprises saturated and unsaturated long-chain fatty acids, alcohols, squalene (which accounts for between 12% and 20% of the wax and cholesterol (6-9%).^[6,7] As such, it is rich in proteins, mainly keratin, although this variation depends upon the secretion's freshness. Instrumentation and excessive cleaning of ear canal often predispose to infection. Itching or pruritis of ear is an irritating sensation accompanied by the tenacious need to scratch. It's accompanied by redness, swelling, flakes and scarring in the area of itchiness. Severe itching may also compel patients to use instrumentation, therefore causing trauma to the external auditory canal. This is one of the causes to bacterial and fungal infections.

A study has revealed that 48% patients had no growth, suggesting that there need not be an underlying bacterial or fungal infection to cause itching. All these patients had a dry canal skin without cerumen. This is attributed to a condition called ASTEATOSIS. Asteatosis is a common condition of the external auditory canal where the skin surface is dry and lacks cerumen.

Due to lack of cerumen, which is protective of the canal, there is a change in the pH of the canal which may make more prone to external ear infections. The dryness of this canal skin leads to itching and subsequent scratching and irritation.^[8] Karakus et al studied the microbiology of external auditory canal in patients with asteatosis and itching and evaluated efficacy of topical 2% alcohol and boric acid solution in patients with normal flora. They concluded that despite normal otoscopic findings, external auditory canal cultures may show pathogenic colonisation in patients with asteatosis. Topical administration of alcohol and boric acid solution relieves itching in patients with normal flora. Hence, it is important to consider asteatosis as one of the differential diagnosis for chronic and persistent itching when all other causes have been ruled out.

Infections of the ear may present with symptoms like earache, discharge, itching, fullness etc. Itching is one of the most distressing complaints of ear disease. It may even be psychological. In our routine clinical practice, we come across many a number of patients who complain of persistent itching of the ears. Some of these cases have some underlying pathological causes to attribute to, whereas very often we do also see cases where the underlying cause remains unknown.

The prevalence of the disease is influenced by a number of predisposing factors such as climate (extremely moist and hot environments), chronic bacterial otitis externa, swimming, dermatomycoses, insertion of foreign objects and wearing head clothes.^[9] Acute diffuse otitis externa (swimmer's ear), chronic otitis externa, otomycosis and scalp lesions are some of the commonest diseases which predispose to itching of the ear.^[10] It may also be associated with neurodermatitis and eczemaous otitis externa.

External auditory canal can harbour certain micro-organisms. Coagulase negative Staphylococcus, Staphylococcus aureus and Streptococcus pneumoniae are the most common bacteria isolated from the external ear canals of healthy people. Corynebacterium species (Turicella otitidis and Corynebacterium auris) have also been isolated in various studies. The third most common recovered bacteria are Streptococci and Enterococci species. Nearly 61% fungal species are involved in external otitis.^[11]

The most common fungal agents are Aspergillus niger (80%), Candida albicans (second most common), Actinomyces, Trichophyton, Aspergillus Fumigatus and Candida Tropicalis.^[12] The relationship between bacteria and external otitis in man is indefinite. Occasionally bacteria are completely responsible for the disorder and anti-bacterial therapy, as indicated by culture and sensitivity tests, will effect an immediate and satisfactory recovery. A knowledge of the bacterial flora of the human ear canal in health is essential in evaluating the possible etiologic significance of organisms cultured from the diseased canal.

AIMS & OBJECTIVES:

The present study is carried out to observe, know and enlist:-

1. To observe the growth of different common aerobic flora in Human cerumen with different sex, religion and age group of population.
2. The cause prevalent in this part of state. By this way diagnosis and treatment modality can be changed and follow-up of the patient can be easy if we know their frequency of occurrence, presentation and responsiveness to specific management given to them.

For example with early diagnosis, appropriate management and follow-up even in the conditions like otomycosis, secondary overgrowth of fungi can be either checked or retracted. And last but not the least to prevent the occurrence of this condition by knowing its cause in this part of the state and educating the population accordingly.

METHOD OF STUDY:

Cases will be asked to tell their complaints in their own words and then a detailed present, past, personal, social and family history will be recorded.

CLINICAL HISTORY:

In history of present illness- Beginning of the disease and its gradual evolution and reference to symptoms and signs will be recorded. A total of 400 patients will be taken. Common symptoms are itching in the ears, pain in the ears, hearing loss, tinnitus and dizziness will be taken. We will exclude patients with middle ear infections- both discharging and non-discharging ears, patients with usage of topical ear drops.

Past History- Previous history of impacted wax, self attempt to clean the ears, instrumentation, hypertension, diabetes mellitus, drug allergy, tuberculosis. Any history of middle ear infections- both discharging and non-discharging ears, upper respiratory tract infections and any usage of topical ear drops less than 2 weeks.

Personal History- Patients occupation, his environment, tobacco chewing, ongoing pregnancy (in females), history of alcohol intake, socio-economic status and food habits will be noticed.

EXAMINATION:

External examination- examination of any congenital deformity of ear, redness, swelling, tragus sign, mastoiditis, examination of mouth, teeth, gums, tongue, nose, nasopharynx, pharynx, paranasal sinuses and throat.

Local Examination:

1. Pinna for any redness caused due to itching and pain.
2. External auditory canal for any furuncle, congestion & trauma caused by instrumentation.
3. Tympanic membrane

Investigation- Blood: Random Blood Sugar

The patients will be followed up on regular visits and details of history, examination, investigations and treatment to be recorded.

SUMMARY & CONCLUSION:

In this study, observation of four-hundred cases of healthy patients with earwax was done at the Department of Otorhinolaryngology, Santosh Medical College and Hospital Ghaziabad U.P during the period of October 2015 to October 2017.

After taking detailed history, each case was thoroughly examined. Different aspects of patients with cerumen were observed. Observations have been thoroughly discussed in the light of relevant available literature on the subject.

These findings may also be related to changes in the skin of the external auditory canal in elderly and notably the size of the ear canal with mother curiosity in ear hygiene cleaning in children. Symptomatic earwax impaction results mainly from pressure effect on the canal wall and blockage of sound wave from reaching the tympanum. This earwax serves an important protective function to the outer part of the ear. Cotton tipped swabs and other object used may push earwax further into the canal and potentially foiling the natural earwax removal phenomenon and causing earwax impaction.

Furthermore, natural ear self-cleaning process of the cerumen can be disturbed by the presence of object such as hearing aid, ear plugs, and so on. These may also cause mechanical milking (excessive cerumen production due to stimulation of the cerumen gland caused by object in the canal).

This study however reveals there was female predominance in age group distribution of cerumen auris impaction with the maximum (33.5%) patients aged between 21-50 years of age. In this study, itching and pain were the main mode of presentation and complications respectively followed by hearing loss. There was large predominance (93.3%) of Gram positive organisms which included 73% of them being as monobacterials. A large percentage of our patients indulge in self-ear cleaning with various objects because they believe earwax is harmful. The community should be counseled against the habit of insertion of foreign objects into the ear canal. Treatment of earwax impaction by the ceruminolytic agent, irrigation, and routine cleaning by clinician by regular ear care are quite beneficial.

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