

Prevention or Treatment of Hunan Ear Pain, Itch or Vertigo (Dizziness) Caused by Cerumen (Earwax) Impaction and Ear Hairs

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Abstract

Introduction: Cerumen impaction occurs in up to 6% of the general population, affecting 10% of children and over 30% of the elderly and cognitively impaired populations. Here, I proposed theoretical models of clinical medicine to prevent or treat the ear pain, itch or vertigo (dizziness) caused by cerumen impaction and ear hairs. I also reported a clinical case to support the theoretical models in the discussion of this paper. **Method:** I used published clinical data and scientific theories in the modeling study. A 63 years old male subject participated in the clinical case investigation. The participant had complained his ear pain and itch for two years without any hearing loss and ear wounds; found cerumen often and discovered rich and long hairs two years ago, in his ear canals; heard his left temporomandibular joint sound recently when eating; and had a history of arthritis symptoms. Following the nonprescription instruction, the entrant applied sterile cotton swabs, medical H₂O₂ (3%) and alcohol (75%) to clean his ear canals as well as used warm running water to massage his ear auricles and roots, temporomandibular joints and temporal points twice daily. **Results:** Modeling results illustrate how a cerumen impaction inducing pain, itch or vertigo is formed by ear hairs and how abnormal oscillations in semicircular canals leading to the vertigos are produced by stimulations. The clinical results show treatment methods are 90% effective in this case report. **Conclusion:** Keeping our whole bodies clean and hygienic are often key points to prevent all of the diseases. Cleaning cerumen is as important as cleaning eye crusts and nasal discharges (mucus). Therefore, ideally I suggest everyone, especially elderly, to clean external ears using methods in this paper (or similar methods) every day. The treatment methods are safe (almost no side effect) and economical. **Discussion:** I suggest using earphones outside of ear canals (auricles), instead of inside of ear canals. I believe arthritis of temporomandibular joints may lead to ear pain or itch sometimes. I also believe the lymphatic motion and oscillation in the inner ears is the same as or similar to that of cardiovascular and nervous systems in principle. The moving or oscillating model of the vestibular (physics) plasma in semicircular canals in this study could also provide a navigational mechanism for bird or other animal migration.

Keywords

H₂O₂, Semicircular Canals, Temporomandibular Joints, Arthritis, Massage, Warm Running Water

1. Introduction

Earwax, also known by the medical term cerumen, is a yellowish, waxy substance secreted in the ear canal of humans and many other mammals. It plays a vital role in the human ear canal, assisting in cleaning and lubrication, and also provides some protection from bacteria, fungus, and insects. However, excess or impacted cerumen can press against the eardrum and/or occlude the external auditory canal and impair hearing [1].

In certain individuals, the self-cleaning mechanism fails, and cerumen can become impacted [2, 3]. Cerumen impaction can occlude the ear canal or press against the tympanic membrane, potentially causing ear discomfort, conductive hearing loss, itching, pain and tinnitus. Cerumen impaction occurs in up to 6% of the general population, affecting 10% of children and over 30% of the elderly and cognitively impaired populations [4, 5].

Cerumen is a naturally occurring, normally extruded product of the external auditory canal. It is usually

asymptomatic, but when it becomes impacted it can cause complications such as hearing loss, pain, or dizziness. The overall quality of the evidence on treatment is limited [6].

Hearing loss is extremely common in late life, affecting 25% to 35% of older persons, and it increases dramatically with advancing age. Mild hearing loss is more likely to be undetected. One of the most common causes of hearing loss in late life is cerumen impaction [7].

I previously proposed models of human cochlea working mechanism [8, 9] and massage with warm running water to treat arthritis [10] as well as lymphedema of superficial lymphatic system [11]. In this study, I continued and expanded my previous studies, and proposed theoretical models of clinical medicine to prevent or treat the ear pain, itch or vertigo (dizziness) caused by cerumen impaction and ear hairs. I also reported a clinical case to support the theoretical models in the discussion of this paper.

2. Method and Material

2.1. Modeling Study

I used published clinical data and scientific theories in this modeling study.

2.2. A Clinical Case Report

2.2.1. Subject

A 63 years old male entrant participated in the clinical case investigation and he agreed to be recruited before the study. The participant had complained his ear pain and itch for two years without any hearing loss and ear wounds; found some cerumen or earwax often and discovered rich and long hairs two years ago (Figure 1), in his external ear canals; heard his left temporomandibular joint sound recently when eating; and had a history of arthritis symptoms.



Figure 1. Rich and Long Human Ear Hairs.

2.2.2. Treatment Method

Following the nonprescription instruction, the subject applied sterile cotton swabs, medical H₂O₂ (3%) and alcohol (75%) to clean his external ear canals as well as used warm

running water [10, 11] to massage his ear auricles and roots, temporomandibular joints and temporal points twice daily. No any prescription is needed for the treatment.

3. Modeling Results

3.1. Cerumen Impaction Caused by External Ear Hairs

Earwax or cerumen is partly sebum, as is mucopurulent discharge, the dry substance accumulating in the corners of the eye after sleeping. Production, composition, and different 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 [1], i.e., earwax is a mixture of desquamated keratinocytes and hair combined with the secretions [12].

Cleaning of the ear canal occurs as a result of the "conveyor belt" process of epithelial migration, aided by jaw movement. The conveying is 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 [1].

Earwax is produced by glands in the skin of the outer portion of the ear canal. Only the thicker cerumen-producing ear canal skin has hairs [13].

When the external ears have rich and long hairs, the hairs could forbid the caring or conveying out of the cerumen; the cerumen impaction could occur (Figure 2); and the impacted cerumen could induce ear pain, itch and vertigo or dizziness.

Therefore, the impacted cerumen or earwax has to be cleared out and the ear canals have to be cleaned.

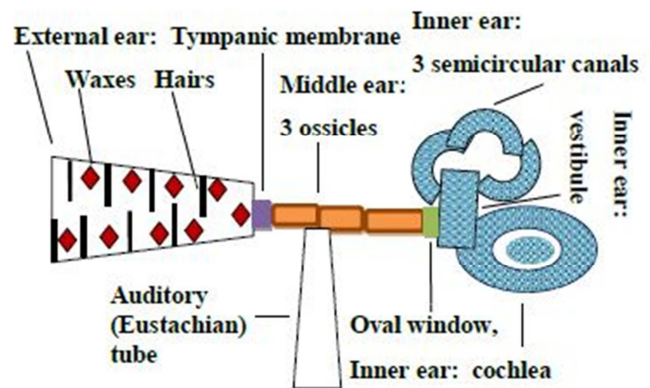


Figure 2. Illustration: how rich long ear hairs forbid the caring or conveying out of cerumen and how the cerumen impaction is formed by the hair. If the auditory tube is blocked, an ear edema could occur [1, 13]. See the text. The draw is not to scale.

3.2. Abnormal Motions or Oscillations in Semicircular Canals Leading to the Vertigos

Motion sickness is a condition in which the endolymph (the fluid found in the semicircular canals of the inner ears) becomes 'stirred up', causing confusion between the difference between apparent perceived movement (none or very little), and actual movement. Depending on the cause, it is also

referred to as seasickness, carsickness, airsickness, or space sickness [1].

I believe vertigo or dizziness is generally a motion sickness and it is caused by abnormal motions or oscillations in semicircular canals.

The three semicircular canals (ducts) are mostly used to sense rotational head movements in the three dimensions [14].

I modeled mechatronic or/and electromagnetic oscillations of quasi plasma (physics) in the semicircular canals in the same way as that in our previous studies [9, 15]. Because magnetic field can be used to experimentally stimulate the rotational sensors [16], magnetic stimulation is used as an example for the stirred oscillation, see Figure 3. Other stimulations have the same (similar) effect as (to) this one in principle.

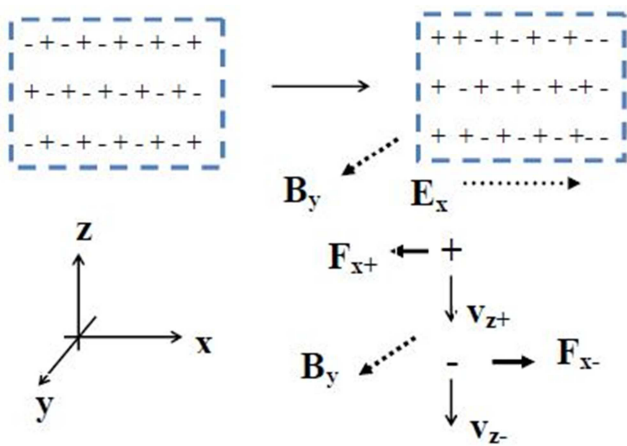


Figure 3. Illustration of ionic oscillation produced by disturbed vestibular (physics) plasma in semicircular canals. The oscillation could be a source of vertigo or dizziness. See the text.

Top left: ideal plasma in vestibule, no net charges.

+: a positive ion; -: a negative ion;

Top right: disturbed plasma in a magnetic field B_y in y direction and produced electric field E_x in x direction.

Bottom left: Rectangular coordinates x, y, z.

Bottom right: v_{x+} : velocity of the positive ion; v_{x-} : velocity of the negative ion; F_{x+} : magnetic force on the positive ion; F_{x-} : magnetic force on the negative ion.

The endolymph plasma can be considered as biological electrolytes, quasi physics plasma of K^+ , Na^+ , Cl^- , Ca^{++} , Mg^{++} , OH^- and H_3O^+ . Based on Newton second law, a modified hydrodynamic equation is embedded with Lorentz force, in conjunction with Maxwell equations of electromagnetism, and the equation can be used to describe the plasma oscillation in this study. The both mechanic and electromagnetic (internal) forces are included [9, 15].

When a strong stirring occurs, no matter it is mechanic or electromagnetic, the ions or particles are often displaced from their equilibrium positions or distances, the redistribution of charges and masses will respectively set up fields or forces, tensions or pressures at the ions or particles. The forces, the tensions or the pressures will restore the ions or particles back to their original equilibrium positions or distances and could initiate a vibration (oscillation), even a resonance.

Under some conditions, the oscillation, even the resonance continues as long as stimulation is powerful enough and retained [9, 15]. An abnormal oscillation or resonance could make vertigo or dizziness.

In this investigation, a press is produced by an impacted cerumen that occludes the external ear canals; an oscillation is mostly triggered by the cerumen press against the tympanic membrane; and the stirring press is delivered by the middle ear to the inner ear: semicircular canals.

4. Discussion

4.1. A Clinical Case Report

4.1.1. Ear Pain and Itch

The subject began to feel a slight pain or itch, without any hearing loss, in inner portions of his external ear canals when he was 61 years old, at the same time he also discovered many long ear hairs grew in the canals (Figure 1). The two phenomena could be correlated each other. Additionally, he often found some cerumen or earwax in his ear canals.

Before this clinical case trial, the subject respectively tried some regular soap, nonprescription rehabilitation cream or medical alcohol (75%) alone, to manage the disease, but he did not feel much better.

During this clinical case trial, the participant followed the nonprescription instruction; to clean his ear canals: (1) applied medical H_2O_2 (3%) twice daily, once in the morning and once in the afternoon and 5 minutes after H_2O_2 treatment, dried the ears canals using the cotton swabs; (2) used medical alcohol (75%) with the cotton swabs twice daily, once at noon, and once at night; additionally, considering a history of arthritis symptoms and hearing the left temporomandibular joint sound recently [17], he used warm running water and massage [10, 11] to clean his ear auricles and roots, temporomandibular joints and temporal points, twice daily, once in the morning and once in the evening.

After one month treatments, the subject felt his pain and itch was more than 90% inhibited in both of feeling intensities and occurring frequencies with a comparison of his feeling without any treatment.

Rich and long hairs keep the inside of external ear canals warm, moisture (sweats or water) and an anaerobic condition that help some bacteria or fungi, especially those do not need O_2 , to live and to proliferate. Therefore, medical H_2O_2 (3%) is critical to kill those anaerobic bacteria or fungi. Medical alcohol (75%) is helpful to depress living and proliferating of general bacteria or fungi.

I also suggest using earphones outside of ear canals (auricles) rather than inside of ear canals, because using earphones inside of the canals for long time has the same (similar) function as (to) that ear hairs have. Additionally, earphone rubbers could hurt the ear canals.

Cleaning cerumen is as important as cleaning eye crusts and nasal discharges (mucus). Therefore, ideally I suggest everyone, especially elderly, to clean external ears using methods in this paper (or similar methods) every day. The

treatment methods are safe (almost no side effect) and economical.

If wounds are found, iodine in alcohol can be applied. Sometimes more than twice treatments are necessary daily.

It could be helpful to massage ear auricles and roots, temporomandibular joints and temporal points using warm running water, to depress arthritis of temporomandibular joint and ear edema [10, 11].

4.1.2. Vertigo or Dizziness

The subject used to have three times of vertigo or dizziness when he was respectively 52, 56 and 61 years old, and he did not have the custom to clean ear (wax/cerumen) daily. Clinical research results of the subject's vertigo or dizziness will be traced in future.

I believe any abnormal stirring disturb, such as physical (e.g., electromagnetic, thermodynamic or caloric, (fluid) mechanic ...), chemical (e.g., molecular, e.g. alcohol, ionic ...) or biologic (e.g., bacteria, fungi, viral), to the endolymphatic plasma in labyrinth (semicircular canals), may induce the abnormal motion and/or oscillation (vibration) as long as the stimulation is strong enough. The abnormal activities may lead to vertigo or dizziness.

I also believe the endolymphatic motion and oscillation is the same as or similar to that of cardiovascular and nervous systems in principle, the systematic oscillations can be studied respectively with ECG and EEG [9, 15].

4.2. General Discussion

In clinical and healthcare medicines, the methods and modeling principle in this study are hopeful to prevent other ear diseases, such as hard of hearing, (stimulation) deafness and blurred vision for people, especially for aging or aged adults.

I think it is ideal to massage, with warm running water, our whole bodies (all joints) once a day; at least once a week. The water could enter and clean our meridian channels by sweat glands and with negative (subatmospheric) pressure [10, 18].

The model of oscillation produced by disturbed vestibular (physics) plasma in Figure 3 could also provide a navigational mechanism for bird or other animal migration.

5. Conclusion

Keeping our whole bodies clean and hygienic are often key points to prevent all of the diseases [18]. Cleaning cerumen is as important as cleaning eye crusts and nasal discharges (mucus). Therefore, ideally I suggest everyone, especially elderly, to clean external ears using methods in this paper (or similar methods) every day. The treatment methods are safe (almost no side effect) and economical.

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