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## RESEARCH ARTICLE

### EAR SYRINGING WITH DIFFERENT MATERIALS, DISTILLED WATER AND WHITE VINEGAR AND DILUTED POVIDONE IODINE (COMPARATIVE STUDY)

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#### ABSTRACT

**Background:** Even with using of electric devices to remove ear wax, the syringing still used by large number of seniors, so Irrigation is used frequently in both primary care and specialty settings. And we should use the materials in syringing that with less chance of causing ear infection. **Objectives:** To find out the difference of effects on getting ear infection between distilled water and white vinegar and diluted povidone iodine in ear syringing. **Patients and methods:** Comparative cross-sectional study focus on 138 patients who need ear syringing to remove ear wax who visit otolaryngology department in AL-Yarmook teaching hospital in a period between February 2017 and April 2018 in determined days in a week., history taken from each patient a routine otolaryngology examinations were done including ear otoscopy, then we divided the sample in to three categories according to the material used in ear syringing, distilled water and white vinegar and diluted povidone. as ear syringing done after dissolving ear wax with the same agent for all patients. Data collected by questionnaire as age, gender, complain, any ear symptoms, ear syringing as mention in the introduction, we made three groups of patients the first who ear syringing with distilled water, the second with povidone iodine 10% diluted by 10cc povidone to 50 cc distilled water, the third is with white vinegar diluted by 10cc vinegar to 40 cc distilled water, and follow up the patient in the 2<sup>nd</sup> and 5<sup>th</sup> and 7<sup>th</sup> days. **Results:** 71 male (51.44%) and 67 female (48.55%) with ear wax, the main age group is (31-45y) i.e. 47 cases out of 138 in percentage (34.05%) , the second age group is (46-60y) i.e. 43 cases out of 138 in percentage (31.15%). using distilled water alone the percentage of ear infection after syringing i.e. otitis externa is 7 cases of 46 patient (15.21%) . By using diluted white vinegar the percentage became less i.e 4 out of 46 patient (8.69%). And finally the povidone iodine (diluted) made the percentage better by only one case out of 46 patients (2.17%).

##### Conclusion

- Concerning wax percentage no male to female preponderance in our study.
- The commonest age group present with wax is (31-45y).
- Using ear syringing with povidone iodine is better than distilled water or even diluted white vinegar by decreasing percentage of ear infection.

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#### INTRODUCTION

**The external auditory canal anatomy:** The external auditory canal extends from the concha of the auricle to the tympanic membrane and is approximately 2.4 cm long. The supporting framework of the canal wall is cartilage in the lateral one-third and bone in the medial two-thirds. The diameter of the canal varies greatly between individuals and between different races. In adults, the cartilaginous portion runs inwards, slightly downwards and forwards. The canal is straightened, therefore, by gently moving the auricle upwards and backwards to counteract the direction of the cartilaginous portion.

In the neonate, there is virtually no bony external meatus as the tympanic bone is not yet developed, and the tympanic membrane is more horizontally placed so that the auricle must be gently drawn downwards and backwards for the best view of the tympanic membrane. In the adult, the lateral cartilaginous portion is about 8 mm long and is continuous with the auricular cartilage. The medial border of the meatal cartilage is attached to the rim of the bony canal by fibrous bands. There are two horizontal fissures, described by Santorini, that lie anteroinferiorly in the cartilaginous portion that possibly increase flexibility but allow passage of infection or tumour into the parotid gland. The bony canal wall, about 1.6 mm long, is narrower than the cartilaginous portion and itself becomes smaller closer to the tympanic membrane. The medial end of the bony canal is marked by a groove, the

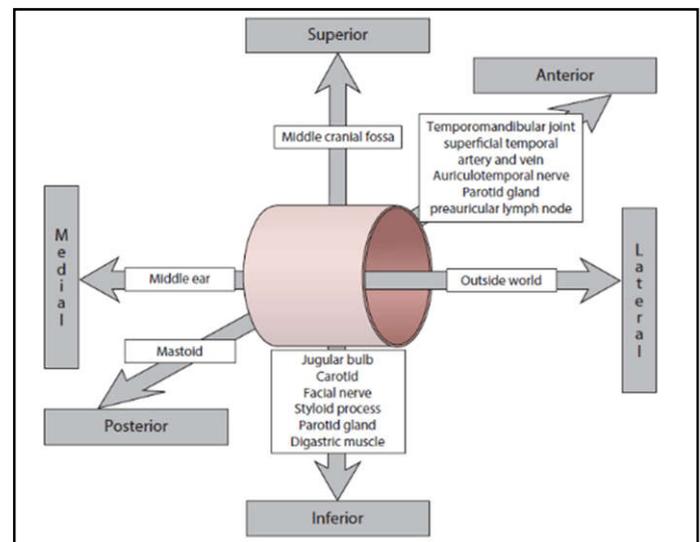
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tympanic sulcus, which is absent superiorly. Although the tympanic bone makes up the greater part of the canal, and also carries the sulcus, the squamous bone forms the roof. Therefore, there are two suture lines in the canal wall with the tympanosquamous anteriorly and the tympanomastoid posteriorly. These suture lines may be more or less developed; they project into the canal with overlying closely adherent skin, which can make raising an intact tympanomeatal flap a challenge. The tympanomastoid suture is a complex suture line between the anterior wall of the mastoid process, a portion of the squamous bone and the tympanic bone. Apart from these intrusions into the canal, there are two constrictions: one at the junction of the cartilaginous and bony portions and the other, the isthmus, 5 mm from the tympanic membrane where a prominence of the anterior canal wall reduces the diameter. Deep to the isthmus, the anteroinferior portion of the canal dips forwards forming a wedge-shaped anterior recess between the tympanic membrane and the canal. This recess can be a difficult spot for access either in the clinic or at surgery. The external canal is lined with keratinizing stratified squamous epithelium, which lacks the rete pegs and skin appendages in the thin skin of the bony canal. Body skin normally grows directly from the basal layers towards the surface where it is shed into the surroundings. Excess proliferation in the scalp trapped by the hair is dandruff. If this pattern of growth were to occur in the external ear canal, the canal would soon become filled with desquamated skin. Instead of maturation taking place directly towards the surface, there is outward, oblique growth of the epidermis of the canal skin and pars flaccida so that the surface layers effectively migrate towards the external opening of the canal. The normal rate of migration is about 0.1 mm/day, although this range is hugely variable and in some conditions there is complete failure of migration with a consequent build-up of shed keratin in the ear canal. It has been postulated that patients who are prone to cerumen impaction may lack a 'keratinocyte attachment destroying substance' (KADS) based on the observation they have much longer sheets of desquamated keratin which are in continuity with the stratum corneum, when compared to patients with no issue.

At the outer limits of the ear canal are some short hairs that project towards the opening of the canal. There are fine vellus hairs and larger terminal hairs called tragi (Greek: 'goat'), which tend to be more prominent in males in whom they are a second sexual characteristic. These hairs are oriented with their tips laterally and increase in number and length from the bony-cartilaginous junction laterally, so helping to prevent the entrance of foreign bodies. In the skin of the cartilaginous canal are clusters of ceruminous and sebaceous glands. The ceruminous glands are modified apocrine sweat glands that open into the root canal of the hair follicles and produce a watery, white secretion that slowly darkens, turning semi-solid and sticky as it dries. Since these glands are apocrine sweat glands, they respond to many stimuli such as adrenergic drugs, fever and emotion which, along with direct mechanical stimulation, can all produce an increase or altered secretion. The sebaceous glands produce an oily material (sebum) from the breakdown of their fat-containing cells which is usually excreted into the root canals of the hair follicles. The mixture of desquamated cells, cerumen and sebum forms wax. Human earwax is a Mendelian trait consisting of wet and dry forms. Dry wax, lacking cerumen, is yellowish or grey and brittle, while wet wax is brownish and sticky.

The wet phenotype is dominant over the dry type, and is frequently seen in populations of European and African origins. East Asians show the dry phenotype and there are intermediate frequencies among the Native American and Inuit of Asian ancestry. A single-nucleotide polymorphism in the ABCC11 gene is responsible for the determination of earwax type, with the AA genotype corresponding to dry wax and GA and GG to wet wax. <sup>(1)</sup> There is dispute with regard to the specific antibacterial activity of cerumen in vitro studies. However, the areas of skin that take part in cerumen production have all the components of an active local immune system and probably protect the canal by an antibody-mediated local immune response. Wax is not usually found in the deep ear canal and a lump of 'wax' overlying the upper portion of the tympanic membrane (pars flaccida or attic region) is rarely true wax, but is nearly always associated with an underlying cholesteatoma as it is, in fact, dried-up, oxidized keratin. The sense of the old adage 'beware the attic wax' is still just as true today as it was in the past. Relationships of the right external auditory canal, illustrated in the following figure <sup>(2)</sup>



Ear canal is the only site in the body with skin directly onto periosteum, and is extremely pain sensitive. <sup>(3)</sup>

**Blood supply of the external meatus <sup>(2)</sup>:** The arterial supply of the external meatus is derived from branches of the external carotid. The auricular branches of the superficial temporal artery supply the roof and anterior portion of the canal. The deep auricular branch of the first part of the maxillary artery arises in the parotid gland behind the temporomandibular joint, pierces the cartilage or bone of the external meatus and supplies the anterior meatal wall skin and the epithelium of the outer surface of the tympanic membrane. Finally, auricular branches of the posterior auricular artery pierce the cartilage of the auricle and supply the posterior portions of the canal. The veins drain into the external jugular vein, the maxillary veins and the pterygoid plexus. The lymphatic drainage follows that of the auricle.

<sup>1)</sup> Peter Valentine and Tony Wright. Anatomy and embryology of the external and middle ear, in: John C Watkinson and Raymond W Clarke, *Scott-Brown's Otorhinolaryngology, Head and Neck Surgery*, 8th, Taylor & Francis Group, LLC. 2018; vol 2, P. 527

<sup>2)</sup> Peter Valentine and Tony Wright. Anatomy and embryology of the external and middle ear, in: John C Watkinson and Raymond W Clarke, *Scott-Brown's Otorhinolaryngology, Head and Neck Surgery*, 8th, Taylor & Francis Group, LLC. 2018; vol 2, P. 528.

<sup>3)</sup> David Goldenberg, Bradley J. Goldstein, *Handbook of Otolaryngology Head and Neck Surgery*, Thieme Medical Publishers, Inc. 2011; P 98

**Nerve supply of the external canal** <sup>(2)</sup>: The external auditory canal receives its sensory innervation from the trigeminal, facial, glossopharyngeal and vagus nerves. Frequently, patients can cough when undergoing microsuction of the canal which is caused by stimulation of the vagus nerve via Arnold’s nerve, its auricular branch.

**Ear wax removal:** Many different strategies have been tried over the years for earwax removal, but they basically fall into one of three categories: manual removal, irrigation, and chemical dissolution. Many patients will require a combination of all three stratagems.<sup>(4)</sup>

**Ear irrigation:** Irrigation is used frequently in both primary care and specialty settings. Lukewarm water (to prevent caloric stimulation) is instilled using a large syringe . The auricle is pulled back to straighten the canal and the water is directed to the roof of the ear canal, not directly at the eardrum. A basin is held below the ear to catch the irrigant and wax. Although irrigation is a mostly effective and a time-honored technique, it does put the patient at risk for injury. The irrigation is done, of necessity, blindly, and too much force may damage the canal skin or tympanic membrane. If underlying pathology is present, such as a cholesteatoma or perforation, the introduction of water may worsen the situation and hasten severe infection. Overall, the use of irrigation for cleaning out earwax should be discouraged in inexperienced hands.<sup>(5)</sup>

**Otitis externa definition:** Otitis externa is a generalized condition of the skin of the external auditory canal. It is characterized by oedema and erythema associated with itch, pain and discharge.<sup>(6)</sup>

**Predisposing factors for otitis externa** <sup>(3)</sup>

Type	Factor
Anatomical	Narrow external auditory meatus (EAM) (hereditary, iatrogenic, exostoses, trauma, etc.) Obstruction of normal meatus (keratosis obturans, wax, foreign body, hearing aid, in-ear head phones, hirsute canal, etc.)
Dermatological	Eczema, seborrhoeic dermatitis, psoriasis
Allergic	Atopy, non-atopic allergy, exposure to topical medications
Physiological	Humid environment, immunocompromisation
Traumatic	Skin maceration (bathing or irrigation), ear probing, laceration, radiotherapy, ear candling
Microbiological	Active chronic otitis media, exposure to <i>P. aeruginosa</i> or fungi

**Povidone iodine:** Is effective against gram-positive and gram –negative bacteria, fungi and protozoa and, with a longer exposure time, spores and a range of viruses, it has a rapid antimicrobial effect within 30 seconds without organic stress in vitro. <sup>(7)</sup>

<sup>4</sup>) Matthew B. Hanson, Frank E. Lucente. Diseases of the External Ear , in : P. ASHLEY WACKYM, JAMES B. SNOW JR., *Ballenger’s OTORHINOLARYNGOLOGY 18 HEAD AND NECK SURGERY*, P. Ashley Wackym, James B. Snow, Jr.2016 ; P 679

<sup>5</sup>) Matthew B. Hanson, Frank E. Lucente. Diseases of the External Ear , in : P. ASHLEY WACKYM, JAMES B. SNOW JR., *Ballenger’s OTORHINOLARYNGOLOGY 18 HEAD AND NECK SURGERY*, P. Ashley Wackym, James B. Snow, Jr.2016 ; P 680.

<sup>6</sup>) A. Simon Carney. otitis Externa and Otomycosis, in: John C Watkinson and Raymond W Clarke , *Scott-Brawn’s Otorhinolaryngology, Head and Neck Surgery* , 8th , Taylor & Francis Group, LLC. 2018 ; vol 2, P. 953

<sup>7</sup>) Kramer Aw, Daeschlien G, Kammerlander G et al. An assessment of the evidence on antiseptics : a consensus paper on their use in wound care ,

**PATIENTS AND METHODS**

Comparative cross-sectional study focus on patients who need ear syringing to remove ear wax who visit otolaryngology department in AL-Yarmook teaching hospital in a period between February 2017 and April 2018 in determined days in a week. One hundred thirty eight patients included in the study, history taken from each patient and after permission from the patient was taken a routine otolaryngology examinations were done including ear otoscopy, then we divided the sample in to three categories according to the material used in ear syringing, distilled water and white vinegar and diluted povidone. as ear syringing done after dissolving ear wax with the same agent for all patients. Data collected by questionnaire as age, gender, complain, any ear symptoms, ear syringing as mention in the introduction, we made three groups of patients the first who ear syringing with distilled water ,the second with povidone iodine 10% diluted by 10cc povidone to 50 cc distilled water , the third is with white vinegar diluted by 10cc vinegar to 40 cc distilled water, and follow up the patient in the 2<sup>nd</sup> and 5<sup>th</sup> and 7<sup>th</sup> days.

**Inclusion criteria**

- any case with impacted ear wax.
- both sex.
- patient above age 16 years.

**Exclusion criteria**

- Uncooperative patient.
- Diabetic patient.
- Any patient with previous ear surgery.
- Any patient with tympanic membrane perforation.
- Any patient with external auditory canal infection.
- Patients with bilateral ear wax.

**Questionnaire**

**1- History**

Name: age: gender: male  female   
Occupation: address: tel:

**Complain:-**

Diabetic yes  no   
Hx of tympanic membrane perforation yes  no   
Hx of ear trauma yes  no   
Hx of ear surgery yes  no   
smoker yes  no  if yes how much:

**2- Examinations:**

**Findings**  
General:   
Nose:   
Throat:   
Larynx:

Ear wax:  unilateral  bilateral

Follow up

Day/symptom	Ear pain	Ear itching	Decrease in hearing	Auricle redness	Ear discharge
2nd					
5th					
7th					

## RESULTS

**Table 1. Male / female preponderance**

Group /	total	Male	Percentage	Female	Percentage
Distilled water	46	23	50%	23	50%
Povidone iodine	46	29	63.04%	17	36.95%
White vinegar	46	19	41.30%	27	58.69
Total	138	71	51.44%	67	48.55%

**Table 2. Age distribution**

Group	16-30y	31-45y	46-60y	61-above
Distilled water	7	16	11	12
Povidone iodine	2	22	14	8
White vinegar	6	9	18	13
Total of samples	15	47	43	33
percentage	10.86%	34.05%	31.15%	23.91%

**Table 3. Ear symptoms**

Group	Ear pain	Ear itching	Decrease in hearing	Auricle redness	Ear discharge	Total Of cases	Percentage of total cases
Distilled water	7	5	7	6	7	7	15.21%
Povidone iodine	1	1		1	1	1	2.17%
White vinegar	4	2	1	2	3	4	8.69%

## DISCUSSION

In our study we want to clarify the percentage of ear infection in each type of ear syringing, as there are cases of ear infection after syringing, so in this study we found.

**Sex preponderance:** 71 male (51.44%) and 67 female (48.55%) with ear wax, so in wax percentage there is on sex preponderance in our study.

**Age distribution:** In our study the main age group is (31-45y) i.e. 47 cases out of 138 in percentage (34.05%) this may reflect the age of growth and stress of life in our country, the second age group is (46-60y) i.e. 43 cases out of 138 in percentage (31.15%), this may reflect that this age most of them neglect their health and bad habit of ear cleaning.

**Ear infection:** This is the whole matter of our study, we found that by using distilled water alone the percentage of ear infection after syringing i.e. otitis externa is 7 cases of 46 patient (15.21%). By using diluted white vinegar the percentage became less i.e 4 out of 46 patient (8.69%).

And finally the povidone iodine (diluted) made the percentage better by only one case out of 46 patients (2.17%). So this clarifies that povidone iodine with its antimicrobial properties can resist infection and make its percentage less.

## Conclusion

- Concerning wax percentage no male to female preponderance in our study.
- The commonest age group present with wax is (31-45y).
- Using ear syringing with povidone iodine is better than distilled water or even diluted white vinegar by decreasing percentage of ear infection.

## Recommendations

- We prefer to use diluted povidone iodine in ear syringing to decrease ear infection after ear wash to remove wax or foreign body.
- We recommend to make further studies with different antiseptics is disinfectants.

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