

## Earwax Phenotype Related to A Risk Factor of Middle Ear Cholesteatoma

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### ABSTRACT

In our study, the earwax phenotype of 40 patients with middle ear cholesteatoma were examined earwax in healthy side and distant location from cholesteatoma by inspection. In our result, the middle ear cholesteatoma group was significantly higher in the incidence of wet earwax than in the healthy (control) group. In cases with bilateral middle ear cholesteatoma, the group with wet earwax showed a significantly higher incidence than those with dry earwax. Based on these and other data, the condition of wet earwax in the external ear canal appears to increase middle ear cholesteatoma. Concerning this mechanism, we considered that wet earwax could contribute to prolonging inflammation due to debris pooling in the tympanic recess together with the reduction in the self-cleansing function by the slow migration of wet earwax.

### KEYWORDS

Earwax; Middle Ear Cholesteatoma; Abcc11.

### INTRODUCTION

It has been known that ventilatory dysfunction of the eustachian tube and ear gas exchange failure in the middle ear are extrinsic factors in middle ear cholesteatoma [1, 2]. However, the relationship between human genes such as intrinsic factor and middle ear cholesteatoma are not well understood. Human earwax shows wet and dry types. Yoshiura [3] reported that one single-nucleotide polymorphism (SNP) in the human ATP-binding cassette C11 (ABCC11) could be a determinant of the human ear wax type. The G/G and G/A genotypes correspond to wet earwax, whereas the A/A genotype corresponds to dry earwax. Ishikawa [4] demonstrated the allele frequencies of wet earwax with allele G (Gly180) and dry earwax with allele A (Arg 180) among different ethnic populations. Africans and Europeans showed a high frequency of 80-100% wet earwax. In contrast, east Asians (Japanese, Chinese, Korean, Mongolian) showed a low frequency of 0-30%. The incidence of middle ear cholesteatoma in Europeans with a high frequency of wet earwax was higher than in Japanese

with a low frequency of wet earwax [5]. Therefore, wet considered that the earwax phenotype could be related to middle ear cholesteatoma in Japan.

### METHODS

The earwax phenotype of 40 patients with middle ear cholesteatoma were decided earwax in healthy side and distant location from cholesteatoma by inspection. (Figure1). The present research was approved by the Juntendo University Committee for the Ethical Issues of human genome.

### Statistical tests

Comparisons of data were analyzed by a chi-square test. A p value <0.05 was considered to be significant.

### RESULTS

In Table1, the frequencies of dry earwax and wet earwax were 62.5% (25/40) and 37.5% (15/40), respectively. The incidence of cases with bilateral middle ear cholesteatoma (including

past history of surgery for middle ear cholesteatoma) in the group with wet earwax was 66.7% (10 /15), which was significantly higher than in the dry earwax group, 24.0% (6/25) P < 0.05. Clinically advance grades of middle ear cholesteatoma showed no difference between dry earwax cases and wet earwax cases.

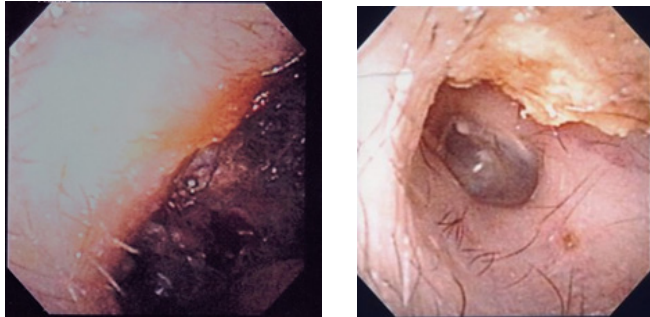


Figure 1: Wet (left) and dry (right) earwax.

Table 1: phenotype type with ear wax in middle ear cholesteatoma.

Ear wax type	Frequency
Dry	25/40 62.5%
Wet	15/40 37.5%
*Bilateral middle ear cholesteatoma: The incidence of cases with bilateral middle ear cholesteatoma (including past history of surgery of middle ear cholesteatoma). The wet earwax group, 66.7%(10/15 ) showed a significantly higher incidence than the dry earwax group, 24.0(6/25) P<0.05.	
Dry	6 /25 24.0%
Wet	10/15 66.7%

## DISCUSSION

Ishikawa [4] described that dry earwax is commonly found within the Asian population, especially among Koreans, Japanese, and Chinese, whereas wet earwax is the dominant phenotype for many Africans and Europeans. In Japan, Takagi [5] performed ABCC11 genotyping for healthy people (372) and patients with middle ear cholesteatoma (156). He demonstrated that the incidence of wet earwax in the middle ear cholesteatoma group was significantly higher 25.6% (40/156) than in the healthy group 15.9% (59/372). In our study, the frequencies of dry earwax and wet earwax phenotype with middle ear cholesteatoma were 62.5% (25/40) and 37.5% (15/40). The frequency of dry earwax in Japanese people is known 70-85% (4-7). However, we have not researched the earwax phenotype mostly for healthy people. Therefore, our data was compared with healthy people (372) checked for ABCC11 genotyping using the Takagi's data [5] as a control group. In the results, the middle ear cholesteatoma group was significantly higher in wet earwax incidence (37.5%, 15/40) than the healthy group (15.9%, 59/372) (P < 0.001). Concerning the incidence of cases with bilateral middle ear cholesteatoma in our study, the incidence of the group with wet earwax (66.7%,(10/15 ) was significantly higher than in the dry earwax

group (24.0%,(6/25)P < 0.05.

From the above findings and other research data, the external ear canal condition of wet earwax could be responsible for an increase in middle ear cholesteatoma. Concerning this mechanism, we considered that wet earwax could promote prolonged inflammation due to debris pooling in the tympanic recess resulting in reduced self-cleaning. This could result in repetitive ear scratching due to bilateral aural fullness and itching leading to bilateral middle ear cholesteatoma.

## DECLARATIONS

Ethics approval and consent to participate.

We collected samples under oral and written informed consent.

The present research was approved by the Juntendo University Committee for the Ethical Issues concerning the human genome.

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