Role of impacted cerumen in hearing loss

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Abstract

We performed a study to determine if cerumen in the ear canal causes significant hearing loss and to ascertain if there is any correlation between the amount of cerumen and the degree of hearing loss. Our study was conducted on 109 ears in 80 patients. The results indicated that impacted cerumen does cause a significant degree of conductive hearing loss. We found no significant correlation between the length of the cerumen plug and the severity of hearing loss. Nor did we find any significant correlation between the presence of impacted cerumen and variables such as age, sex, ethnicity, or affected side.

Introduction

Cerumen is a mixture of secretions produced by the sebaceous and ceruminous glands and substances such as desquamated epithelial cells, shed hairs, and foreign bodies.[1]

No standard system exists to classify the degree of ear blockage caused by cerumen. Crandell and Roeser suggested using audiometric findings—specifically, the amount of conductive hearing loss—to classify the degree of cerumen blockage of the ear canal.[2] In their scheme, cerumen was classified as nonoccluding (<50% blockage of the ear canal), excessive (50 to 80% occlusion but no noticeable conductive hearing loss and an air-bone gap of ≤10 dB at two frequencies), or impacted (>80% occlusion with associated conductive hearing loss and an air-bone gap >10 dB at two or more frequencies).

In this article, we describe our effort to determine if cerumen causes significant hearing loss and to ascertain if there is any correlation between the amount of cerumen and the degree of hearing loss.

Patients and methods

Initial candidates for our study included all patients who underwent an ear examination at our otorhinolaryngology clinic from November 2000 through October 2001. Of this group, we selected those in whom visualization of the tympanic membrane was not possible because of cerumen accumulation. Exclusion criteria included a history of tympanic membrane perforation and the presence of a grommet, severe vertigo, or a cholesteatoma.

A total of 80 patients—aged 5 to 72 years—met the eligibility criteria for this study in at least one ear. Of the 80 patients, 29 had bilateral cerumen blockage and 51 had unilateral blockage, for a total of 109 ears. Of the 109 ears, 61 were male ears and 48 were female ears; 47 ears (43.1%) belonged to Malays, 33 ears (30.3%) belonged to Indians, and 29 ears (26.6%) belonged to Chinese. All patients provided a thorough ENT history, and all underwent a thorough ENT examination by direct otoscopy and, when necessary, microscopy. These patients also underwent pure-tone audiometry (PTA) at frequencies ranging from 125 Hz to 8 kHz.

Following this initial evaluation, all patients were instructed to self-administer sodium bicarbonate eardrops for 1 week and asked to report back to the outpatient clinic within a week thereafter. At that time, the cerumen was removed in one piece under direct vision or with otomicroscopic guidance. The length of the removed cerumen plug was measured with calipers.

Ears were reexamined following removal of the wax, and PTA was repeated. The effect of cerumen on aural acuity was measured by comparing hearing thresholds at 250, 500, 1,000, and 2,000 Hz before and after cerumen removal. The mean air-bone gap was calculated at the same frequencies.

Statistical comparisons of all variables were analyzed using the independent t test. The significance of the difference in the mean air-bone gap before and after cerumen removal was analyzed using the paired t test.

Results

Impacted cerumen caused a significant degree of conductive hearing loss, as evidenced by an improvement in hearing of 11 to 20 dB in 50.5% of patients and an improvement of 21 to 30 dB in 29.4% of patients following cerumen removal (table 1). Statistical analysis indicated that the change in the mean air-bone gap before and after cerumen

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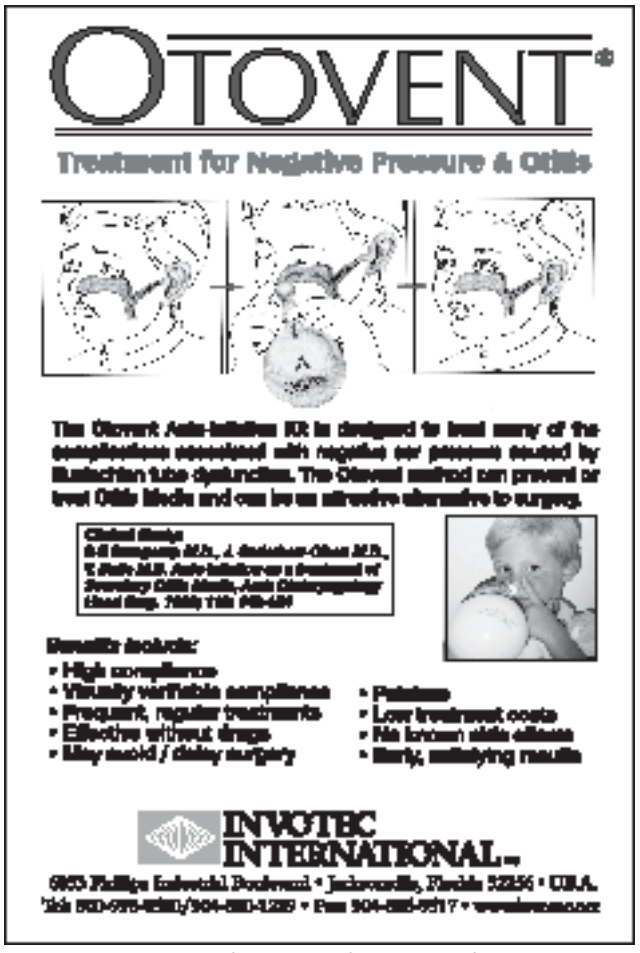

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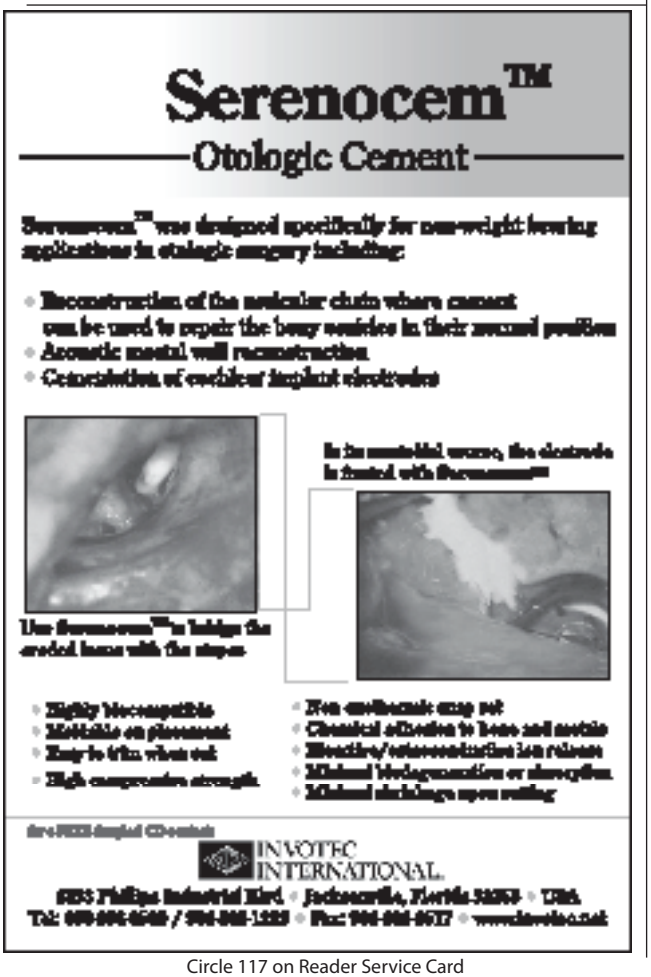

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Table 1. Change in air-conduction threshold following removal of cerumen in the 109 ears

Change	Ears n (%)
≤10 db	21 (19.3)
11 to 20 db	55 (50.5)
21 to 30 db	32 (29.4)
≥31 db	1 (0.9)

The mean change among all 109 ears was 21.19 dB.

removal in all 109 ears was 21.19 dB; the difference was statistically significant.

The amount of cerumen in an occluded ear canal was not an indicator of the degree of conductive hearing loss, as determined by the lack of association between the length of the cerumen plug and the mean change in the air-bone gap (table 2).

No aspect of cerumen occlusion was significantly associated with variables such as age, sex, ethnicity, or affected side.

Discussion

The consequences of cerumen impaction can be divided into two major types: medical and audiologic. In addition to hindering examination of the ear, the medical complications include tinnitus, ear pain, diminished hearing, vertigo, external otitis, and chronic cough.[3,4] Audiologically, cerumen occlusion adversely affects audiometric test results in some cases and prevents testing in others.

The role that impacted cerumen plays in deafness is disputed.[1,5] In 1964, Chandler reported the results of his study that examined the effects of ear canal occlusion on hearing loss.[6] He measured the relationship between the degree of blockage and the amount of threshold shift across audiometric frequencies and found a loss of low-frequency PTA sensitivity. However, Chandler used impression materials to occlude the ear canal rather than earwax, so his findings are questionable. Still, the loss of low-frequency PTA sensitivity in his report explains why patients complain of sudden-onset hearing loss when an ear canal becomes completely occluded. In reality, hearing loss does not become apparent until threshold sensitivity is affected in the speech frequencies.

In our study, we found no correlation between the incidence of impacted cerumen and age. Other authors have reported a higher incidence in the elderly, in school-aged children, and in patients with mental retardation.[2,7-12] We found no statistically significant difference in the incidence of impacted cerumen or the amount of earwax among the three ethnic groups represented in our study—Malays, Indians, and Chinese. Nor did we find any relationship between any aspect of cerumen impaction and sex, which is not surprising because the chemical makeup of cerumen is the same in both sexes.[13]

Table 2. Mean change in air-bone gap according to the length of the cerumen plug

Length	Change
8 mm	15.0 dB
9 mm	20.0 dB
10 mm	20.0 dB
11 mm	16.6 dB
12 mm	24.5 dB
13 mm	23.3 dB
14 mm	28.0 dB
15 mm	30.0 dB

Finally, the lack of association between the length of the cerumen plug and the degree of conductive hearing loss might be explained by the fact that even a small opening in the impaction can permit sound to travel to the tympanic membrane. Another possible explanation is that sound-conducting air might be present between the cerumen and the tympanic membrane.

Future studies would benefit from a larger sample population and a more accurate measurement of the amount of cerumen that takes into account the area of the ear canal and the volume of cerumen.

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