



Cerumen: A fundamental but neglected problem by pediatricians



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ABSTRACT

Objectives: Under physiological conditions, cerumen (Ce) is regularly extruded from the ear canal by a self-cleaning mechanism. Failure of this mechanism leads to excessive accumulation or impaction of Ce. Limited data are available concerning the prevalence of cerumen in healthy and sick infants and children. We assessed the prevalence of Ce in a large population of infants and children and compared the Ce removal attitudes of paediatricians (PEDs) and otorhinolaryngologists (ENTs).

Methods: Children seen in November 2014 for acute respiratory infections, including suspected acute otitis media, or well-being visits, were enrolled. The following data were recorded: presence, laterality, and amount of Ce; presenting complaints and final diagnosis; attempt to remove Ce during the visit; and type of physician.

Results: Among 819 children aged 1 month to 12 years, Ce was present in 594 (72.5%), of whom 478 (80.5%) had bilateral Ce, and 261 (43.9%) had Ce in a relevant amount (cerumen obstructing at least 50% of the ear canal). Presence of Ce was more common in younger and in African or Asian children. PEDs were less likely to remove cerumen than ENTs (28.8% vs 91.0%, $p < 0.001$) irrespective of age, gender, race and reason for visit. Ce was removed by PEDs in less than one-third of sick children with a final diagnosis of acute otitis media (AOM) (31.6%) compared with almost all the children by ENTs (95.6%, $p < 0.001$).

Conclusion: Ce is highly prevalent in healthy and sick children but is quite neglected by PEDs. Educational programs to reinforce the importance of Ce removal and to improve the techniques for removal in case of suspected AOM should be implemented and rigorously evaluated in order to avoid incorrect diagnosis and erroneous treatments.

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1. Introduction

Cerumen (Ce), or earwax, is a naturally occurring substance that is a mixture of secretions (i.e., sebum together with secretions from

modified apocrine sweat glands) and sloughed epithelial cells. It is normally present in the external auditory canal and cleans, protects, and lubricates the skin of the canal. Under physiological conditions, Ce is regularly extruded by a self-cleaning mechanism assisted by jaw movements, which causes it to migrate out of the ear canal [1]. Failure of this mechanism leads to excessive accumulation or impaction of Ce, which is associated with the development of symptoms (i.e., hearing loss, tinnitus, sensation of fullness, itching, otalgia, discharge, odor or cough) and can prevent

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the assessment of the ear canal/tympanic membrane, the audio-vestibular system or both.

The prevalence of Ce impaction in children has not been precisely defined. Most of the available data indicate a prevalence of approximately 10% [2]. However, because these data are derived primarily from studies performed in school-aged children living in developing countries during the assessment of hearing impairment [3–6], it is highly likely that they indicate only a portion of the pediatric cases that suffer from Ce impaction. Younger children frequently suffer from acute upper respiratory infections that can be complicated by the development of acute otitis media (AOM) followed by otitis media with effusion [7]. More rarely, children can suffer from chronic suppurative otitis media or otitis externa. In all these clinical conditions, an accurate visualization of the tympanic membrane is essential for an adequate diagnostic and therapeutic approach.

Unfortunately, studies assessing the prevalence of Ce in children suffering from these diseases are rare, largely outdated and have been performed in a limited number of patients [8–11]. Moreover, little is known about the attitudes of pediatricians (PEDs) towards Ce removal, and whether they frequently diagnose and treat ear problems only on the basis of assumptions, instead of reliable data, has not been clarified. This information is important for the improvement of diagnostic and therapeutic approaches for ear diseases in children.

The goal of this study was to improve our knowledge of these issues. The prevalence of cerumen impaction was assessed in a large population of infants and children with and without respiratory problems. Moreover, the attitudes of PEDs towards removing Ce was evaluated in comparison to ear, nose, and throat specialists (ENTs).

2. Subjects and methods

2.1. Study design

This cross-sectional study was performed in Italy over one week in 2014 (10 through 16 November) after the protocol had been approved by the Ethics Committee of the Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy. Written informed consent of a parent or legal guardian was required for each enrolled child.

Two groups of physicians were involved: PEDs and ENTs. PEDs working in primary care and hospital-based PEDs in 6 Italian municipalities (Milan, Turin, Genoa, Naples, and Caserta) for a total of 55 individuals were invited to participate through an e-mail sent approximately 30 days before the beginning of the study. Details of the study were included with the invitation in the e-mail. The same invitation was sent to the ENTs. All the ENTs were working in the Department of Otorhinolaryngology of 4 municipalities (Milan, Modena, Siena and Naples). The total number of invited ENTs was 54.

2.2. Methods

A group of experts in otitis media (including four of the authors of the study: PM, NM,GF, and NP) established the criteria to assess and grade Ce accumulation. The presence of Ce was graded according to the degree of reduction of the ear canal lumen observed by means of otoscopy as follows: 0% (no Ce); circular (Ce lining the ear canal in a circular way and narrowing the lumen without impeding the visualization of the eardrum); 25% (obstruction of one-quarter of the ear canal); 50% (obstruction of half of the ear canal); 75% (obstruction of three-quarters of the ear canal); and 100% (complete obstruction and no visualization of the tympanic

membrane). The grading was categorical, and no intermediate obstruction level was reported. The intermediate levels were rounded to the nearest fixed obstruction levels.

A total of 50 PEDs (70% in primary care and 30% hospital-based) and 48 ENTs (all hospital-based) accepted the invitation to participate and were invited to a meeting prior to the initiation of the study. During this meeting, we explained in detail that PEDs had to enroll the first 7–15 children seen during the study period for an acute respiratory infection or for assessment of health status (well-being visits). Similarly, ENTs had to enroll the first 3–5 children seen during the study period either for (a) an acute upper respiratory infection not previously seen by a PED or (b) long term status assessment after tonsillectomy; children having undergone previous adenoidectomy or adenotonsillectomy or any ear surgery were excluded. Patients with respiratory disorders had to be classified into two disease groups: acute otitis media or other respiratory diseases (i.e., rhinosinusitis, pharyngitis, croup, infectious wheezing, acute bronchitis, or pneumonia) on the basis of signs and/or symptoms using well-established criteria [12]. AOM had to be suspected in the case of fever, earache, irritability and a history of previous AOM episodes and considered definitively confirmed only after otoscopic examination. All these data and the final diagnosis had to be recorded on a prepared electronic chart after the otoscopy was performed.

The presence of Ce together with other elements required evaluation of the ear canal and eardrum status according to the previously described grading criteria and had to be recorded in the card. To avoid interobserver variability, each pediatrician involved in the study repeatedly examined a group of 30 slides showing different degrees of Ce accumulation during the meeting until good agreement was obtained among the participants (K value > 0.80). Finally, any attempt to remove the Ce in children with Ce accumulation was reported.

2.3. Statistical analysis

Descriptive statistics were generated for the responses, and the χ^2 and t-tests for independent samples were used to compare the categorical and continuous variables. All of the analyses were two tailed. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated to measure the associations between selected characteristics, and the risk of Ce accumulation. The ORs were obtained using unconditional multiple logistic regression, either crude or adjusted for age, gender, race and clinical conditions. All of the analyses were made using Stata 13SAS Version 8.2 (StataCorp. 2013. Stata: Release 13. Statistical Software. College Station, TX: StataCorp LP). Spearman's rho was used to assess the correlation between left and right ear canal.

3. Results

A total of 819 children (452 males, 55.2%) were enrolled by the PEDs (667 children) and ENTs (152 children). Among them, 104 (12.7%), 179 (21.9%), 283 (34.5%), and 253 (30.9%) were 1–12, 13–36, 37–72, and 73–108 months old, respectively. Ce was detected in 594 (72.5%) cases, with detection in only one ear canal in 116 cases (14.1%) and in both ear canals in 478 cases (58.4%; $p = 0.01$). Table 1 shows the presence of visible Ce according to age, gender, race, and reason for visit. The presence of Ce was more common in younger children and decreased with increasing age ($p = 0.01$). Moreover, Ce was significantly more common among African and Asian children ($p < 0.0001$) and children who visited for AOM ($p < 0.0001$).

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