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Diagnostic criteria of eosinophilic otitis media, a newly recognized middle ear disease

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Abstract

Objective: Eosinophilic otitis media (EOM) is a newly recognized intractable middle ear disease, characterised by the accumulation of eosinophils in middle ear effusion and middle ear mucosa. Since EOM patients show gradual or sudden deterioration of hearing, it is important to properly diagnose EOM and to start adequate treatment for EOM. We aimed to investigate the clinical risk factors of EOM and to establish the diagnostic criteria of EOM.
Patients and methods: We reviewed 138 patients with EOM and 134 age-matched patients with the common type of otitis media with effusion or chronic otitis media as controls. We analyzed the incidence of the following clinical variables in both groups: bilaterality of otitis media, viscosity of middle ear effusion, formation of granulation tissue in the middle ear, response to the treatment for otitis media, deterioration of bone conduction hearing level, and association with other diseases such as bronchial asthma, chronic rhinosinusitis, nasal polyposis, and allergic rhinitis.
Results: A high odds ratio was obtained from an association with bronchial asthma (584.5), resistance to conventional treatment for otitis media (232.2), viscous middle ear effusion (201.6), association with nasal polyposis (42.17), association with chronic rhinosinusitis (26.49), bilaterality (12.93), and granulation tissue formation (12.62). The percentage of patients with EOM who were positive for two or more among the highest four items was 98.55%.
Conclusion: A patient who shows otitis media with effusion or chronic otitis media with eosinophil-dominant effusion (major criterion) and with two or more among the highest four items (minor criteria), can be diagnosed as having EOM. Patients with ear symptoms should have the proper diagnosis of EOM using the proposed diagnostic criteria, and then can receive adequate treatment, resulting in prevention of deterioration of hearing and quality of life.

Keywords: Eosinophilic otitis media; Bronchial asthma; Middle ear effusion; Nasal polyposis; Chronic rhinosinusitis; Diagnostic criteria

1. Introduction

Eosinophils are effector cells in the pathogenesis of allergic disease. Historically, Koch [1] first reported that some of the cases with chronic otitis media (COM) showed eosinophil-enriched secretion, and that the macroscopic appearance had characteristics such as highly viscous middle ear secretion with edematous pink mucosa. The high incidence of accompanying nasal allergy has been reported [1]. In 1993, Tomioka et al. [2] reported cases of intractable otitis media with effusion (OME) and COM patients associated with bronchial asthma. Middle ear effusion and otorrhea in those cases contained numerous eosinophils and were very viscous. They named this condition as eosinophilic otitis media (EOM) because the

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effusion contains many eosinophils regardless of the presence of type I allergy [3]. Similar case reports have been published in Japan [4].

The mechanism of accumulation of eosinophils in the middle ear has not yet been determined. However, eosinophil chemoattractants such as IL-5 and eotaxin have been detected in middle ear effusion [5,6], and the expressions of eosinophil chemoattractants such as eotaxin, regulated on activation, normal T expressed and secreted (RANTES), and ecalectin mRNAs have also been found in middle ear mucosa by in situ hybridization [6]. These findings indicate that active eosinophilic inflammation locally occurs in the middle ear [7].

EOM is now recognized as an intractable otitis media and is a fairly common middle ear disease not only in Japan but also worldwide. One of the striking events of EOM is the high incidence of gradual or sudden deterioration of hearing [2–4]. Clinical surveillance of EOM in Japan demonstrated that among 190 EOM patients, approximately one-half showed deterioration of bone conduction hearing threshold and 6% became completely deaf [8].

There are several chronic intractable middle ear diseases showing clinical characteristics that are extremely different from the common type of OME and COM. Each disease requires a specific treatment to cure or control the disease; otherwise, patients will suffer persistent otorrhea and progressive hearing loss, resulting in a worsening quality of life (QOL). The following items were nominated for chronic intractable middle ear diseases: otitis media tuberculosa, cholesterol granuloma, anti-neutrophil cytoplasmic autoantibody (ANCA)-related vasculitis syndrome such as Wegener's granulomatosis and Churg-Strauss syndrome (CSS), and EOM.

The concept of EOM has not been properly recognized and EOM tends to be overlooked. Although the clinical characteristics of EOM have been previously reported [4,9], nothing is known about the incidence of each characteristic in EOM and common types of otitis media to make a definitive diagnosis of EOM. Therefore, it is critical to determine risk factors of EOM and to resolve diagnostic criteria of EOM. When diagnosis of EOM is established, early intervention of patients with adequate treatment could prevent deterioration of hearing loss and persistent otorrhea, leading to improvement of their QOL.

2. Materials and methods

2.1. Patients

This analysis was based on the retrospective clinical data of patients from the EOM study group, which is a Japanese multicentre study involving five referral centers. One hundred thirty-eight patients who were diagnosed with EOM were collected from five centers of the EOM study group. The patients included 86 females and 52 males, aged 19–77 years at the first visit to each center (mean ± SD: 50.5 ± 13.1 years). The patients had a middle ear effusion or middle ear mucosa in which the accumulation of eosinophils was detected histologically or cytologically, and they showed clinical characteristics as described by Nagamine et al. [4]. One hundred thirty-four age-matched patients (86 females and 48 males) with non-eosinophilic COM or OME were also enrolled as controls. All of the control patients underwent tympanoplasty or insertion of a tympanostomy tube at Jichi Medical University Saitama Medical Center and were aged between 18 and 77 years (51.6 ± 13.7 years). The difference in the age distributions of both groups was not statistically significant. Informed consent was obtained from all the patients.

2.2. Determination of clinical characteristics

Based on the previous report by Nagamine et al. [4], the following clinical characteristics of each patient in both groups were analyzed: bilaterality of otitis media, viscosity of middle ear effusion, formation of granulation tissue in the middle ear, response to the treatment for otitis media, deterioration of bone conduction hearing level (BCHL), and association with other diseases such as bronchial asthma, chronic rhinosinusitis, nasal polyposis, and allergic rhinitis. Viscosity of middle ear effusion was defined as when middle ear effusion was difficult to remove by Rosen's ear suctioning tube because of high viscosity. If the condition of the middle ear mucosa was grade 3 by the classification of Iino [9], i.e., highly thickened or granulated to an extent beyond the position of a normal eardrum, this was defined as granulation tissue formation. The response to conventional treatments for common otitis media such as myringotomy and insertion of a ventilation tube for OME, and administration of systemic or topical antibiotics and tympanoplasty for COM were investigated. If the treatment was not effective (except for systemic or topical administration of corticosteroids), the condition was defined as resistance to treatment.

2.3. Evaluation of hearing

The air conduction hearing level and BCHL of each patient in both groups were assessed by pure tone audiometry. The latest audiometric results were evaluated. Deterioration of the BCHL was identified if the BCHL of each patient was beyond 30 dB for at least one frequency at 250–4000 Hz.

2.4. Association with other diseases

Patients of both groups were diagnosed with bronchial asthma if they had a history or had been treated by respiratory physicians using inhaled or systemic corticosteroids using the guidelines for the management of bronchial asthma. A diagnosis of chronic rhinosinusitis was made by rhino-endoscopic findings (e.g., mucous or purulent rhinorrhea,