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Children hospitalized due to acute otitis media: How does this condition differ from acute mastoiditis?

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ABSTRACT

Objectives: To evaluate the clinical picture and microbiological findings of children hospitalized due to acute otitis media and to analyze how it differs from acute mastoiditis.
Methods: A retrospective review of the medical records of all children (0–16 years) hospitalized due to acute otitis media in the Department of Otorhinolaryngology at the Helsinki University Hospital, between 2003 and 2012. Comparison with previously published data of children with acute mastoiditis ($n = 56$) from the same institute and period of time.
Results: The most common pathogens in the children hospitalized due to acute otitis media ($n = 44$) were *Streptococcus pneumoniae* (18%), *Pseudomonas aeruginosa* (16%), *Streptococcus pyogenes* (14%), and *Staphylococcus aureus* (14%). One of the most common pathogens of out-patient acute otitis media, *Haemophilus influenzae*, was absent. Otorrhea was common in infections caused by *S. pyogenes* and otorrhea via tympanostomy tube in infections caused by *P. aeruginosa*. In children under 2 years-of-age, the most common pathogens were *S. pneumoniae* (43%), *Moraxella catarrhalis* (14%), and *S. aureus* (7%). *S. pyogenes* and *P. aeruginosa* were only found in children over 2 years-of-age. Previous health problems, bilateral infections, and facial nerve paresis were more common in children hospitalized due to acute otitis media, compared with acute mastoiditis, but they also demonstrated lower CRP values and shorter duration of hospital stay. The number of performed tympanostomies and mastoidectomies was also comparatively smaller in the children hospitalized due to acute otitis media. *S. aureus* was more common and *S. pneumoniae*, especially its resistant strains, was less common in the children hospitalized due to acute otitis media than acute mastoiditis.
Conclusions: Acute otitis media requiring hospitalization and acute mastoiditis compose a continuum of complicated acute otitis media that differs from common out-patient acute otitis media. The bacteriology of children hospitalized due to acute otitis media resembled more the bacteriology of acute mastoiditis than that of out-patient acute otitis media. The children hospitalized due to acute otitis media needed less surgical treatment and a shorter hospitalization than those hospitalized due to acute mastoiditis.

1. Introduction

Acute otitis media (AOM) is a common infection in childhood. It was estimated that in Finland with a population of 5 million, there were about 500 000 episodes of AOM in the year 1999 [1]. At least in high-income countries, AOM has a strong tendency for spontaneous remission without complications [2]. AOM is treated with a short course of per oral antibiotics or in some countries

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initially with expectant observational approach [2]. There is only seldom need for hospitalization. It may be needed due to difficulties in out-patient treatment, due to prolonged, severe symptoms of infection not responding to antimicrobial treatment or due to complications of otitis media. Especially young children with diagnosed AOM benefit from antimicrobial treatment [2,3]. AOM may lead to recurrent acute otitis media (RAOM) [3], otitis media with effusion (OME), chronic otitis media (COM), and their complications [4]. In complicated AOM the purulent infection may spread to the structures surrounding the middle ear and cause acute complications, such as: perforation of the tympanic membrane, facial paresis, labyrinthitis, osteitis, and bone erosion, acute mastoiditis (AM), abscess formation, thrombophlebitis, or intracranial complications. After reporting our previous work where we evaluated the children hospitalized due to AM in our clinic [5], we now aim to evaluate the clinical picture of children with AOM requiring hospitalization and to find out how this patient group differs from children with AM. Since young children with AOM have been found to benefit especially from antimicrobial treatment [2,3], we also aim to evaluate these young children separately.

2. Methods

The medical records of all patients hospitalized in the Department of Otorhinolaryngology at the Helsinki University Hospital due to acute otitis media (AOM) and acute mastoiditis (AM) between 2003 and 2012 were retrospectively reviewed from the hospital database. The medical records were searched from the hospital database using ICD-10 (2010) codes H65 (non-suppurative otitis media), H66 (suppurative and unspecified otitis media), H67 (otitis media in diseases classified elsewhere), H70 (mastoiditis and related conditions), and H75 (other disorders of middle ear and mastoid in diseases classified elsewhere). Helsinki University Hospital is a tertiary referral centre providing health care services to approximately 1.5 million people. The diagnosis of AOM or AM was initially made in the Department of Otorhinolaryngology. We re-evaluated the diagnoses according to the inclusion criteria used in this study. The diagnostic criteria of AOM used in our study were: symptoms of acute ($\leq$14 days) illness (fever, ear ache, or respiratory symptoms) and findings of middle ear effusion with signs of infection (bulging, redness or abnormal mobility) of the tympanic membrane in otomicroscopy or recent onset of otorrhea not due to otitis externa. These criteria are in accordance with the Finnish national guidelines for the treatment of AOM [6]. The patient records of all children (0–16 years) hospitalized due to AOM, were selected for further analysis. The data analysis included age, gender, medical history, pre-hospital medications, signs and symptoms of infection, laboratory tests, bacteriological cultures, radiological examinations, medication, surgical treatment, and clinical outcome. Samples for bacteriological cultures were aspirated from the middle ear through a paracenthesis of the tympanic membrane or taken from middle ear effusion through a prior tympanostomy tube. PCR analysis of the samples was not performed. Children <2 years were classified as younger children, and children $\geq$2 years as older children. In Sections 3.8–3.10, the data of children hospitalized due to AOM are compared with our previously published data of children hospitalized due to AM at the same hospital department during the same period of time [5]. The criteria of AM used in this study were the findings of AOM and at least two of the following symptoms (with no other medical condition explaining the findings): protrusion of the pinna, retroauricular redness, retroauricular swelling, retroauricular pain, retroauricular fluctuation and/or abscess in the ear canal and/or purulent secretion or acute infection in the mastoid process in mastoidectomy [5].

The study protocol was approved by the local Ethics Committee of Helsinki University Hospital.

2.1. Statistical analysis

The statistical analysis was conducted with SPSS statistics 19.0 software (IBM Corporation, Armonk, NY). Mann–Whitney *U* test was used to analyse equality of medians between continuous variables. Chi-square test and Fisher's exact test, when appropriate, were performed to determine significance between categorical variables; *p*-values of <0.05 were regarded as statistically significant.

3. Results

3.1. Age, demographics

Our patient material consists of 44 hospitalized AOM patients: 24 (55%) were female. The mean age was 6 years (median 4 years). Fourteen patients (32%) were under the age of 2 years. Bilateral infection was found in 17 patients (39%), 16 patients (36%) had AOM on the right side, and 11 patients (25%) on the left side. All children had only one episode of AOM requiring hospital treatment within our study period. The yearly number of cases is presented in Fig. 1: 12 cases occurred in spring, 7 in summer, 17 in autumn, and 8 in winter.

3.2. Medical history of patients

All patients were hospitalized due to difficulties in out-patient treatment, due to prolonged, severe symptoms of infection not responding to antimicrobial treatment, or due to complications of otitis media. In one patient, hospitalization occurred partly due to difficulties in out-patient treatment because of the patients' developmental disorder. Twenty-three patients (52%) were previously healthy with no prior general illnesses. Some medical background condition was found in 21 patients; allergies or atopy were evident for 6 patients; 3 patients each had a developmental disorder, asthma, and hypothyreosis; and 1 patient each had a heart condition, colitis ulcerosa, ichthyosis, and early puberty. Twenty-six patients (59%) had a prior history of AOM, 12 patients (27%) of RAOM, and 4 (9%) of OME. Adenoidectomy had been performed on 7 patients (16%) and previous ear surgery (cochlear

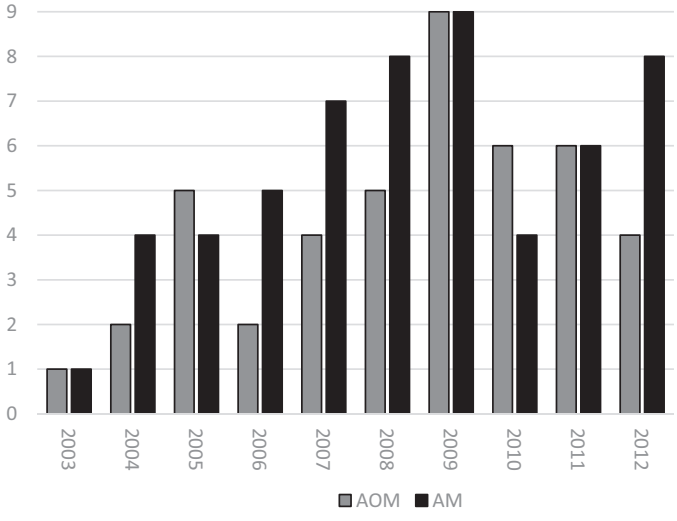

Fig. 1. Yearly number of patients hospitalized due to acute otitis media (AOM) and acute mastoiditis [5] (AM) (Laulajainen-Hongisto et al. Bacteriology in relation to clinical findings and treatment of acute mastoiditis in children, Int. J. Pediatr. Otorhinolaryngol. 78 (12) (2014) 2072–2078)