



## Infants under the age of six months with acute mastoiditis. A descriptive study of 15 years in Sweden



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### ABSTRACT

**Objective:** To investigate the occurrence, clinical signs and outcome of acute mastoiditis in infants under the age of 6 months in Sweden between the years 1993–2007.

**Methods:** All ENT departments in Sweden reported children 0–5 months treated for acute mastoiditis 1993–2007 and all records were reviewed. The clinical course and various characteristics were recorded.

**Results:** Seventeen young infants with acute mastoiditis were identified. Three patients had suffered acute otitis media earlier, otherwise the children were previously healthy. Preceding the episode of acute mastoiditis, the children had an upper respiratory tract infection or fever for seven days in mean (median three days) and the mean number of days with ear-symptoms was three days (median two days). Three patients were treated with antibiotics prior to admittance. Almost all children presented with clear retroauricular signs with protruding ear and redness behind the ear. The children were hospitalised for six days (mean and median). Eight patients (47%) suffered from a subperiosteal abscess. All but one patient underwent surgery: myringotomy (13); incision or puncture of the mastoid (5); mastoidectomy (3). *Streptococcus pneumoniae* was the most frequent bacterium identified in cultures. No intracranial complications or other severe complications were found.

**Conclusion:** Acute mastoiditis is extremely rare in infants under the age of 6 months. The patients in this study did not have any predisposing diseases. An upper respiratory tract infection had preceded the episode of acute mastoiditis for some time in the majority of cases, but the time from first ear symptoms to hospitalization was very short. Acute mastoiditis is a potentially life-threatening disease, but the timely administration of intravenous antibiotics and surgical intervention prevented the occurrence of severe complications in these young infants.

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### 1. Introduction

Acute mastoiditis (AM) is very rare in young infants and little has been published on AM in this group [1]. However, as the disease can give rise to serious complications, including death it is important to be able to recognize and treat the condition as quickly as possible.

AM is a complication of acute otitis media (AOM), in which the infection spreads into the mastoid process. The mastoid air cell

system of infants is not fully developed, and there is only one large cell, the antrum. Blockage of the aditus ad antrum due to mucosal swelling in AOM traps pus containing virulent bacteria in the mastoid, leading to the development of AM [1]. The infection may progress if bacteria cause mastoid cortex erosion or pass directly through the emissary veins of the bone of the mastoid to the periosteum, causing periostitis and, in some cases, a subperiosteal abscess. The peak incidence of AM is seen in the second year of life [2–4]. Once treated, AM resolves in the majority of cases without sequelae [5,6]. However, AM can be associated with life-threatening complications, such as meningitis, brain abscess and sinus thrombosis [7].

The aim of this study was to describe the occurrence, clinical signs and outcome of AM in young infants. All cases of mastoiditis in infants under 6 months of age in Sweden during a 15-year period between 1993 and 2007 were analyzed.

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## 2. Subjects and methods

All 34 ENT (ear-, nose- and throat) departments in Sweden were invited to participate in the study. One small department denied participation because of the lack of time. This department reported three cases of AM during the time period, but none were in the age group of this study. Patients treated for AM during the period 1993–2007 were identified by ICD numbers (International Classification of Diseases), and infants under 6 months of age were included in the study. The required criteria for AM were: clinical signs of AOM (ongoing or within 14 days prior to inclusion) with two or more retroauricular signs of infection, or mastoidectomy was performed with purulent discharge/signs of acute infection in the mastoid process.

The charts were reviewed and the following data were recorded: age, sex, medical history, duration of upper respiratory tract (URT) infection, ear symptoms and antibiotic treatment prior to hospitalization, results of clinical examinations and laboratory tests, bacterial cultures, treatment after admission, duration of hospital stay, clinical outcome, complications and sequelae. Also follow-ups at the ENT departments were recorded. Data on the Swedish population in the age group and over the years in question were obtained from Statistics Sweden (governmental agency) and were used in incidence calculations. The study was approved by the Regional Ethical Review Board in Lund (study no. H4143/2007).

## 3. Results

A total of 17 infants with AM under the age of 6 months were identified during the 15-year period (Fig. 1). The youngest was 2 months; and twelve were boys (70%). The incidence of AM in infants under 6 months was 1.24/100,000 per year. None of the children had any previous systemic disease or known syndrome. Three children had suffered one episode of AOM before the current episode, but none had had previous ear surgery. Ten of the infants (59%) had had an URT infection for a mean of seven days (median three days) before the AM episode. One child had had varicella preceding the AM episode, and one child was diagnosed with concurrent mononucleosis. The mean number of days of ear symptoms prior to admission was three days (median two days). Three patients had been treated with antibiotics prior to admission because of fever and signs of earache or URT infection. One infant had received penicillin V, one amoxicillin, and one amoxicillin/clavulanic acid. In one of these cases AOM had been diagnosed during this time.

The right ear was affected in eight patients and the left ear in the other nine cases. None of the children had bilateral AM. In most cases, the contralateral ear was healthy, but three cases presented with bilateral AOM, and secretory otitis media was present

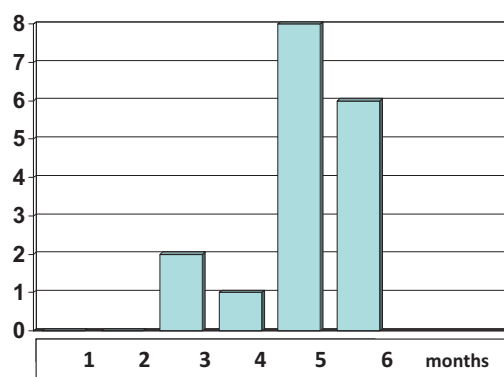


Fig. 1. Age of included children.  $N = 17$ .

contralaterally in two cases. Five patients (29%) had ear discharge from the AM affected ear at the time of admission. Fifteen patients (88%) had a protruding ear, and in twelve patients (71%) redness behind the ear was reported. Swelling behind the ear was seen in fifteen patients (88%). Only one patient had no retroauricular signs at the time of admission, despite bone destruction in the mastoid, found at mastoidectomy. This patient is further commented on in the discussion. Eight patients had a subperiosteal abscess (47%). Diagnosis of subperiosteal abscess was made by the CT-scan (3) in combination with puncture or incision over the mastoid (4), mastoidectomy (3) or spontaneous drainage (1).

Thirteen patients were in good general health at admission, while the general health of two patients was slightly affected (no information was available on the remaining two patients). Six patients were reported as having fever, while data concerning fever were lacking in eight patients. The mean C-reactive protein level at admission was 96 mg/l (median 84), and the mean white blood cell count was  $19$  (median  $20$ )  $\times 10^9/l$ .

All patients received intravenous antibiotics (14 cefuroxime, three penicillin G). The infants were treated for six days in hospital (mean and median). Five patients underwent computerized tomography (CT), and signs of cortical bone destruction of the mastoid was seen in three of them. Mastoidectomy was performed in one of the patients who underwent CT. All but one patient underwent surgery: myringotomy (13); incision or puncture of the mastoid (5); mastoidectomy (3). Three patients who were not myringotomized directly underwent mastoidectomy, and the only patient who did not undergo surgery showed spontaneous discharge from the subperiosteal abscess.

No intracranial complications or other severe complications were seen. All children recovered without sequelae. The data from hearing tests performed after recovery were available for four patients, and showed normal hearing. Follow up data was available from ten patients. Patients were followed for up to four years at the most, 1.1 year in mean and 0.5 year in median. Seven patients had AOM, two had SOM, two had tube insertions (one of the SOM cases earlier mentioned) during the follow-up period. None of the children had recurrent AM, which was controlled by checking the whole database for AM patients 1993–2007 [5]. In all three cases of AM where mastoidectomy was performed, the causal agent was *S. pneumoniae*.

### 3.1. Bacteriology

All bacterial findings are presented in Fig. 2. The data on anaerobic cultures were lacking. There were no bacteria with reduced sensitivity to antibiotics. Some of the cultures showed multiple bacterial species, and findings could be diverse from different locations in the same child. Therefore, the culture sites were arranged hierarchically. Cultures from an abscess or from the

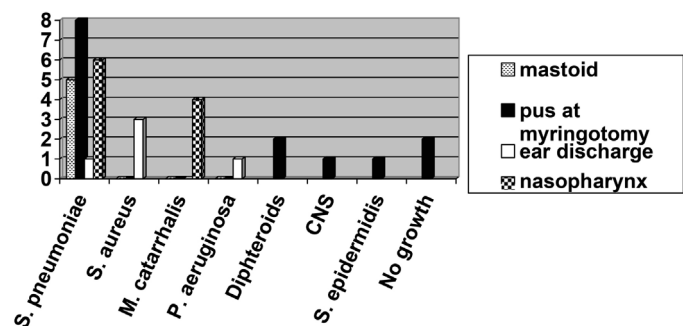


Fig. 2. Number of positive cultures from various sites of the following bacteria: *Streptococcus pneumoniae* (*S. pneumoniae*), *Staphylococcus aureus* (*S. aureus*), *Moraxella catarrhalis* (*M. catarrhalis*), *Pseudomonas aeruginosa* (*P. aeruginosa*),

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