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Acute mastoiditis in Greenland between 1994-2007

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ABSTRACT

Introduction: The indigenous populations of the Arctic are prone to middle ear infections starting with an early age first episode, followed by frequent episodes of acute otitis media (AOM) during childhood. A high proportion develop chronic otitis media. Acute mastoiditis is a serious complication of AOM in childhood with postauricular swelling, erythema, and tenderness, protrusion of the auricle, high fever and general malaise. The disease may protrude intracranially. The incidence rates for acute mastoiditis in the Western world range from 1.2 to 4.2 cases/100 000 per year. There exists no epidemiological data on acute mastoiditis in the Arctic region.

Methods: A retrospective search was made for the WHO ICD-10 code DH70.0 (denoting acute mastoiditis) using the National Greenland Inpatient Register for the period 1994–2007, inclusive. Fifteen patients were registered and their medical records were retrieved. Four patients were obviously misclassified, leaving 11 patients for evaluation. The medical records were available for 10 patients. The diagnostic inclusion criterion was written clinical signs of acute mastoiditis.

Results: Based on the case series the incidence rate was calculated to be 1.4 for the total Greenlandic population and 7.4 for children 0 and 10 years of age. Median age was 14 months (5–105 months) and eight were female (72%). Seven of the 10 were

exclusively treated with antibiotics and three underwent additional ear surgery. Bacteriological examination was performed in five of 10. One 8 month-old girl presented with a contemporary facial nerve paralysis and was treated with intravenous antibiotics; one 8 year-old girl was evacuated to Copenhagen for urgent surgery due to signs of meningitis. Acute CT scan showed a cerebellar abscess and a thrombosis in the lateral sigmoid sinus vein. An extensive cholesteatoma was found and eradicated during surgery. Six weeks later the patient returned home with a maximal conductive hearing loss as the only complication. All patients recovered from the disease.

Conclusion: The incidence of acute mastoiditis in Greenland is comparable to the incidence elsewhere, although AOM occurs more frequently among small children in the Greenlandic population. The disease is serious and must be treated immediately with intravenous antibiotics, followed by urgent surgery if there is no improvement.

Key words: children, Inuit, mastoiditis, otitis media.

Introduction

The Indigenous populations in the Arctic are prone to middle ear infections starting with early and frequent episodes of acute otitis media (AOM) during childhood[1]. A high proportion develop chronic otitis media[1]. Acute mastoiditis is a serious complication of AOM in childhood with the typical clinical appearance of postauricular swelling, erythema and tenderness; protrusion of the auricle; high fever and general malaise[2]. The symptoms are caused by a subperiosteal abscess. A lowering of the roof of the external ear canal may be seen on otoscopy. The tympanic membrane is most often intact but pus is visible in the middle ear behind the membrane. The infection may protrude intracranially causing brain abscess formation and meningitis. The incidence rates for acute mastoiditis in the Western world range from 1.2 to 4.2 cases/100 000 per year[3-6]. These studies are based on retrospective hospital registers and medical records. The causative agents are most often *Streptococcus pneumonia* or group A streptococci[3,5,6]. There is no epidemiological or microbiological data on acute mastoiditis in the Arctic.

Greenland is part of Denmark covering 2 415 100 km^2 with a length of 2600 km. The population is 55 000, of which 50 000 are of Inuit descent. There are 16 healthcare districts and each has a small hospital. The only large hospital is in the capital Nuuk which has approximately 15 000 inhabitants. Since 2003 and 2005 respectively, this hospital has had a paediatric and an otorhinolaryngologic department to which complicated cases are referred from other parts of Greenland. Before these departments existed Greenlanders requiring paediatric specialist treatment or ear surgery were often referred to similar departments at Rigshospitalet in Copenhagen, Denmark. However, children with acute mastoiditis appear to have only been referred selectively, and so no single central department has been responsible for the treatment and the care of these patients.

The aims of this study were to examine the incidence of acute mastoiditis and the clinical appearance of the disease in a population with a very high incidence of otitis media and a high incidence of invasive bacterial disease.

Methods

A retrospective search was made for the WHO ICD-10 code DH70.0 (denoting acute mastoiditis) using the National Greenland Inpatient Register for the period 1 January 1994 to 31 December 2007. All children with this code were expected to have been hospitalized for intravenous antibiotic treatment. In total 15 patients were found and after tracking their medical records at the local hospitals, four were obviously misclassified and excluded. Medical records were available for 10 of the remaining 11 patients. The diagnostic criteria for inclusion were a DH70.0 code, preferably with

written clinical signs of acute mastoiditis, and no obvious reasons for misclassification (eg old age). The project was approved by the local ethics committee in Greenland (no. 2008-16).

Definitions

Mastoiditis is an infection in the mastoid bone. It is most often associated with a recent episode of AOM, although this has been questioned recently[3-6]. In the most severe cases, the bone itself becomes infected and an abscess arises subperiosteally in the mastoid process. Optimal treatment is intravenous antibiotics with acute drainage (myringotomy), insertion of ventilation tubes and/or acute mastoidectomy[3,5,6].

Statistics

To calculate the incidence, the mean population born and living in Greenland in 1994 and 2007 was divided by the number of study years, using official Greenland statistics[7]. The incidence in children was calculated by dividing the mean number of children aged 10 years or younger in 1994 and 2007 by the number of study years[7].

Results

The total population incidence rate was 1.4/100 000 per year and 7.4 for children 0–10 years of age. The median age was 14 months (range 5–105) and eight were female (72%). Although the patients were from different parts of Greenland, five of the 11 were from the capital Nuuk. An even distribution was found during the study period.

Individual clinical appearance and treatment are shown (Table 1). Seven of 10 children were treated with antibiotics exclusively and three had additional ear surgery. Microbiological sampling and bacterial culture was performed in 50%, with *S. pneumoniae* found in one, while the others had group A streptococci, coagulase negative staphyloccocci, and *Haemophilus influenzae*; one case had no bacterial growth.

An 8 month-old girl developed a contemporary facial nerve paralysis and was treated with intravenous antibiotics, while an 8 year-old girl was evacuated to Copenhagen for urgent surgery due to signs of meningitis. A CT-scan showed a cerebellar abscess and thrombosis in the lateral sigmoid sinus vein. An extensive cholesteatoma was found and eradicated during surgery, and 6 weeks later the patient returned to Greenland suffering only maximal conductive hearing loss. All children recovered.

Discussion

The incidence of acute mastoiditis in Greenland is comparable with that in other parts of the world where rates between 1.2 and 4.2/100 000 have been reported[3-6], based on hospital registries. In a Norwegian National Registry study incidence rates between 13.5 and 16.8/100 000 were found in children aged less than 2 years, and between 4.3 and 7.1/100 000 in children between 2 and 16 years[8]. Thus, although AOM and chronic otitis media are very frequent among Inuit in Greenland, this does not seem to result in a higher incidence of acute mastoiditis. Treatment with antibiotics is widespread in Greenland and this is so for AOM. Worldwide, the incidence of acute mastoiditis is rising and it has been suggested that this is due to less aggressive antibiotic treatment of AOM in some countries; however, this has not been confirmed by epidemiological studies[8].

The present study results are based on data from retrieved the medical records in the National Inpatient Register in Greenland. While this method may be unreliable, especially due to the low frequency of cases, it is comparable to methods used in most studies of the epidemiology of acute mastoiditis[6]. The Norwegian National Registry study did not include validation using medical records[8]. The present study may, in fact, have defined the minimum frequency of acute mastoiditis, with possible causes for under-reporting or under-registration of acute mastoiditis being misclassification or no registration at all.

Table 1: Demographics of and clinical findings in 11 Greenlandic children with the diagnosis acute mastoiditis in the 14 year period 1994–2007

Age (months)	Sex	Town	Symptoms	Microbiology	Antibiotics	Surgery	Complications
36	M	Maniiitsoq	No data	No data	No data	No data	No data
12	F	Tasiilaq	No data	No	Yes	No	No
19	M	Narssaq	PS + pain + OM	No	Yes	No	No
105	M	Sisimiut	PS + OM + cholesteatoma	Yes	Yes	Yes	Intracranial abscess + VII paresis
42	M	Sisimiut	Red PS + pain + OM	No	Yes	No	No
8	F	Ilulissat	Red PS + pain + OM	Yes	Yes	No	No
8	M	Nuuk	Red PS + pain +OM + VII paresis	No	Yes	No	VII paresis
14	M	Nuuk	Red PS + pain + OM	Yes	Yes	Yes	No
5	F	Nuuk	Red PS + pain + OM	No	Yes	No	No
47	M	Nuuk	Red PS + pain + OM	Yes	Yes	No	No
6	M	Nuuk	Red PS + pain + OM	Yes	Yes	Yes	No

M, Male; F, female; PS, postauricular swelling; OM, otitis media; VII, facial nerve.

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An additional potential cause of misclassification is a wrong diagnosis. Differential diagnoses for acute mastoiditis include more severe episodes of AOM or AOM with mastoidismus. The latter presents with postauricular erythema and AOM but without abscess formation. Thus, there is a risk of classifying acute mastoiditis as an episode of AOM; it may be difficult to distinguish between these, especially for the inexperienced physician. Similarly, in remote areas such as some parts of Greenland, diagnoses are made by specially trained nurses (although this was not apparent in the present study). Accurate diagnosis is crucial, for acute mastoiditis is a serious disease that must be treated immediately with intravenous antibiotics, followed by urgent surgery if prompt improvement is not obtained.

Unfortunately the microbiological results in the present study are unlikely to be reliable. Microbiological sampling and culture is difficult in Greenland due to its vast distances and the only fully equipped laboratory being situated in the capital Nuuk. Therefore, antibiotic treatment outside the capital often relies on a clinical judgment alone. However, it was an unexpected finding that not all the children from Nuuk had a microbiological sample taken for culture and examination.

In the present study one child had the severe complication of an intracranial abscess and sigmoid sinus thrombosis, and during surgery a cholesteatoma was found. Infection in an undiagnosed cholesteatoma may present as acute mastoiditis. Thus, children with acute mastoiditis should be referred for thorough otological examination to avoid overlooking concurrent ear disease. Two children had the complication of facial nerve paralysis but both recovered after treatment. This complication is usually temporary, due to resolution of oedema compressing the nerve in the middle ear when the infection is treated.

Conclusion

The incidence of acute mastoiditis in Greenland seems relatively low, although AOM and chronic otitis media occur very frequently among small children. The incidence may actually be higher due to misclassification of diagnoses. The disease is serious and must be treated immediately with intravenous antibiotics, followed by urgent surgery if no improvement occurs.

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References

1. Homøe P, Christensen RB, Bretlau P. Acute otitis media and sociomedical risk factors among unselected children in Greenlandic. *International Journal of Pediatric Otorhinolaryngology* 1999; **49(1):** 37-52.

2. van den Aardweg MTA, Rovers MM, de Ru JA, Albers FWJ, Schilder AGM. A systematic review of diagnostic criteria for acute mastoiditis in children. *Otology & Neurotology* 2008; **29:** 51-57.

3. Spratley J, Silveira H, Alvarez I, Pais-Clemente M. Acute mastoiditis in children: review of the current status. *International Journal of Pediatric Otorhinolaryngology* 2000; **56:** 33-40.

4. Van Zuijlen, Schilder AG, Van Balen FA, Hoes AW. National differences in incidence of acute mastoiditis: relationship to prescribing patterns of antibiotics for acute otitis media. *Pediatric Infectious Diseases Journal* 2001; **20(2):** 140-144.

5. Katz A, Leibovitz E, Greenberg D, Raiz S, Greenwald-Maimon M, Leiberman A et al. Acute mastoiditis in Southern Israel: a twelve year retrospective study (1990 through 2001) *Pediatric Infectious Diseases Journal* 2003; **22:** 878-882.

6. Pang LHY, Barakate MS, Havas TE. Mastoiditis in a paediatric population: a review of 11 years experience in management. *International Journal of Pediatric Otorhinolaryngology* 2009; **73:** 1520-1524.

7. Statistics Greenland. *Greenland in Figures 1994 and 2007*. (Online) no date. Available: http://www.stat.gl/ (Accessed 15 April 2010).

8. Kvaerner KJ, Bentdal Y, Karevold G. Acute mastoiditis in Norway: no evidence for an increase. i>International Journal of Pediatric Otorhinolaryngology 2007; **71(10):** 1579-83.

