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ACUTE MASTOIDITIS IN PEDIATRIC POPULATION

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Summary

Introduction. Among intratemporal complications of acute otitis media, acute mastoiditis (AM) is the most common one. The diagnosis is based mainly on the clinical features, though radiological imaging can be helpful in more serious cases. The management consist of conservative and surgical treatment.

Material and methods. The retrospective analysis of patients with acute mastoiditis hospitalized in the Department of Pediatric Otolaryngology of Medical University of Warsaw from January 2011 to January 2013 was done. Data assessed included demographic characteristics, the type of complications, applied antibiotic therapy and surgical treatment.

Results. 24 patients with acute mastoiditis were admitted to the hospital. The median age was 3.86 years (age range: 8 months to 13 years). Myringotomy was done in 20 patients (83%). Simple mastoidectomy was performed in 9 cases (37.5%). 6 patients had mastoid subperiosteal abscess. The standard antibiotic treatment was in most cases cefuroxime and clindamycin. In 3 patients the cause of mastoiditis was chronic inflammation process.

Conclusions. Acute mastoiditis occurs in most cases due to acute inflammatory process. The initial management always involves broad-spectrum antibiotic therapy. If there is no tympanic membrane perforation with otorrhea, myringotomy should be performed. In case of mastoid subperiosteal abscess, simple mastoidectomy (antromastoidectomy) can be indispensable, although abscess drainage plus myringotomy has been discussed in literature as equally good treatment.

Key words: acute mastoiditis, complications of acute otitis media, myringotomy, mastoidectomy

INTRODUCTION

The complications of acute otitis media may be intratemporal and extratemporal. Acute mastoiditis is the most common intratemporal complication of acute otitis media. Other intratemporal complications include acute labyrinthitis and perilymphatic fistula, facial palsy, and petrositis (with Gradenigo's syndrome). The development of acute labyrinthitis may lead to sensorineural hearing loss. Extratemporal complications are subdivided into intracranial (meningitis, epidural abscess, subdural abscess, abscess of the central nervous system, sigmoid sinus thrombosis and otic hydrocephalus) and extracranial such as retroauricular, zygomatic and Bezold abscess (1, 2). Even though antibiotics are in widespread use, intratemporal complications of acute otitis media still occur in pediatric population. It is often that patients with AM have no previous history of middle ear diseases. In the study of Luntz et al. 72% patients had negative history for middle ear pathology (3). The classical clinical features of acute mastoiditis are fever, erythema and tenderness in postauricular area, with displacement of the auricle (fig. 1). There are insufficient data to provide an evidence-based diagnostic scheme for acute mastoiditis. Management of AM consist of antibiotic therapy, radiological imaging including ultrasound and/or computed tomography if needed and surgical procedures (4).

MATERIAL AND METHODS

The retrospective analysis was performed in the group of patients with acute mastoiditis that were hospitalized in the Department of Pediatric Otolaryngology of Medical University of Warsaw from January 2011 to January 2013. The analysis included data such as demographic characteristics, the type of complications, applied antibiotic therapy and the type of surgical procedures.

RESULTS

In the analyzed group of patients there were 24 children, with the male predominance (M = 14, 58% vs.



Fig. 1. Acute mastoiditis in pediatric patient.

F = 10, 42%). The median age was 3.86 years. The range of age was from 8 months to 13 years. All patients were diagnosed with acute mastoiditis, which more often involved the right side (n = 16, see tab. 1). In almost all of the patients acute mastoiditis was the complication of acute inflammation process (n = 21). In 3 patients the cause occurred to be chronic otitis media, from whom the youngest patient aged 8-months old was hospitalized three times independently due to recurrent episodes of mastoiditis. 6 children (25%) had subperiosteal abscess. Almost all of the patients needed to undergo surgical procedure (n = 22, 92%), that is showed in table 2. Myringotomy was done in 20 patients (83%). One patient, before admission to our ward, had had ventilation tube insertion, which was done in other hospital. The rest three patients had purulent otorrhea on admission. Simple mastoidectomy was performed in 9 cases (37.5%), in 5 of them subperiosteal abscess was revealed intraoperatively. In other 4 cases, when mastoidectomy was performed, it was due to no clinical progress in treatment (n = 2), and/or development of intracranial complications (n = 2). One of these patients had mastoidectomy accompanied by drainage of epidural abscess. The other patient with suspicion of meningitis and in septic condition had bilateral antromastoidectomy. In one case of mastoid subperiosteal abscess drainage of the abscess and myringotomy was done. In all patients intensive intravenous antibiotic therapy was applied. The standard antibiotic first-line treatment in our ward is cefuroxime plus clindamycin (fig. 2). The results of bacterial ear culture were as following: *Streptococcus pneumoniae* (n = 2), *Candida parapsylosis* (n = 1) and the bacterial culture from the abscess material: *Streptococcus pneumoniae* (n = 2), *Streptococcus pyogenes* (n = 1), *Streptococcus mitis* (n = 1), *Peptostreptococcus asachoryliticus* (1).

Table 1. The final diagnosis and side indication.

Final diagnosis	Number	Right side	Left side	Bilateral
Acute mastoiditis	24	18	6	0
Acute otitis media	24	13	6	5
Mastoid subperiosteal abscess	6	5	1	0
Chronic otitis media	3	2	0	1
Temporal bone inflammation	1	0	1	0
Intracranial complications: Epidural abscess Suspicion of meningitis, sepsis	2	0	1	0

DISCUSSION

Acute mastoiditis is the most common complication of acute otitis media, but what is curious, just in some cases the history of otitis media is noted and according to some authors (Pang et al., 5) in most cases (58%) mastoiditis may be the initial diagnosis. However, ENT specialists

Table 2. Surgical procedure chosen and side indication.

Surgical procedure	Number	Right side	Left side	Bilateral
Myringotomy	20	9 (one patient had 2 times myringotomy during different hospitalizations)	6	5
Myringotomy with tympanostomy tube	1	1	0	0
Antromastoidectomy	9	6	2	1
Drainage of mastoid subperiosteal abscess	1	0	1	0
Drainage of epidural abscess	1	0	1	0

should be aware of the possible non-infectious etiology of acute mastoiditis which can be myelocyticleukaemia or Langerhans' cell histiocytosis. Thus, a non-infectious etiology should be suspected in every atypical, persistent or recurrent case of acutemastoiditis (6).

Groth et al. revealed that there is a significant difference of the clinical characteristics of AM between age groups. Children younger than 2 years old had more frequently clinical symptoms, had higher incidence of fever and elevated C-reactive protein and white blood cells counts compared to older children. Acute mastoiditis was also more common in that age group (12).

The mean age of patients with acute mastoiditis range from 2.1 years old to 31.8 months and the median age from 1.3 years old to 54.2 months according to different authors (7-9). There is no evident sex prevalence in AM incidence (10, 11). In our material the median age was 3.86 years, with male predominance. There are several articles from different countries concerning incidence of acute mastoiditis. For instance, the incidence of AM in the United States throughout years 1997 to 2006 has not been increasing based on the article of Pritchett et al. The incidence of AM in Greenland is comparable to the incidence elsewhere, although acute otitis media occurs there more frequently among small children, with the median age of 14 months (11, 13).

The diagnosis of AM is based mainly on clinical findings. In the danish research almost all of the patients presented with the classical mastoiditis symptoms: 100% had protrusion of the pinna, 95% had retroauricular swelling and redness, whereas 32% had a retroauricular abscess (14). In our study 25% of patients were diagnosed with subperiosteal abscess.

Nevertheless, there can be serious complications, especially the intracranial ones, that can be very insidious and can result in fatal outcome. Thus, computed

tomography which has a sensitivity of 97% in the diagnosis of complicated acute otomastoiditis (according to Migirov) can be of great value in identifying mastoiditis, especially to evaluate the range of inflammatory process and confirm suspected complications (15, 16). In most cases, however, CT does not seem to be indispensable in the diagnosis of AM and conservative therapy, close observation of the patient and follow-up seem to be the optimal first-line management (15-18).

Most of isolated bacteria in acute mastoiditis are *Streptococcus pneumoniae*. Among others less often cultured pathogens are *Streptococcus pyogenes* A, *Staphylococcus coagulase-negative*, *Pseudomonas aeruginosa*, *Fusobacterium necrophorum*, *Haemophilus influenzae* and *Klebsiella Pneumoniae* (3, 9, 10, 14, 15, 18). On the other hand, according to the study of Pellegrini, *Streptococcus pyogenes* was the most frequent pathogen in Spanish population, and it was present in 44% of patients (8).

In relation to antibiotic resistance, in Denmark for instance, *Streptococcus pneumoniae* and group A streptococci in 94% were susceptible to penicillin, which is due to low bacterial resistance toward penicillin in Denmark (7).

There were also some observations of difference in microbiological samples in relation to the age group. There were more culture of *Streptococcus pneumoniae* in children younger than 2 years old with AM, whereas older children more often showed growth of *Streptococcus pyogenes* or *Pseudomonas aeruginosa* or no microbial growth (12).

In many cases, there is negative microbiological growth, that can be the result of antibiotic treatment before admission to the hospital or inappropriate culture specimen collection.

Broad-spectrum parenteral antibiotic therapy and myringotomy with or without ventilation tube insertion should remain first-line treatment in all children with acute mastoiditis (7, 19). In case of mastoid subperiosteal abscess simple mastoidectomy (antromastoidectomy) should be performed, which remains the most effective surgery. However, in some cases, the initial treatment can involve drainage of the abscess (retroauricular puncture) with myringotomy, in non-responding cases needed to be followed by simple mastoidectomy (7, 9, 19). The same opinion has Trijolet, who believes that in the absence of intracranial complications and suspicion of *Fusobacterium necrophorum*, a retroauricular puncture and grommet tube insertion associated with antibiotic therapy is an effective alternative to mastoidectomy in the treatment of AM with subperiosteal abscess (20). This trend in treatment of acute mastoiditis, though, need further long-term studies.

It is essential to underline that simple mastoidectomy should be performed also in all non-responsive cases to previous conservative treatment, in case of unsuccessful subperiosteal abscess drainage or presence of intracranial complications (19). The rate of mastoidectomy differs from 25% to 42% (16, 19). In our material 37.5% of patients with AM underwent simple mastoidectomy.

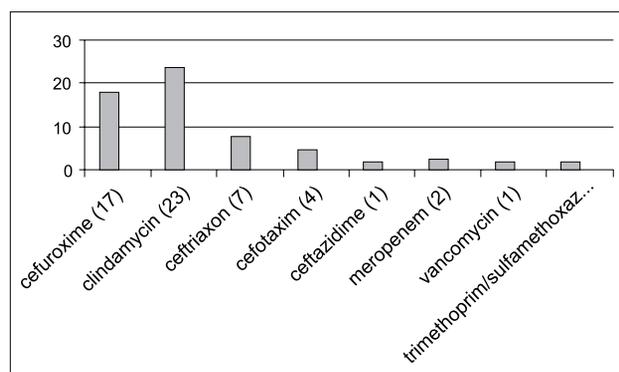


Fig. 2. Type of antibiotics applied during intravenous therapy of acute mastoiditis.

CONCLUSIONS

The most frequent intratemporal complications of acute otitis media in children is mastoiditis. In most cases it is the result of acute inflammatory process. The chosen management should consist of broad-spectrum intravenous antibiotic therapy and surgical treatment. If there was no tympanic membrane perforation with otorrhea, in every case myringotomy should be performed. In case of subperiosteal abscess of mastoid process, simple mastoidectomy may be obligatory, although abscess drainage plus myringotomy has been recently discussed as equally good treatment. □

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