



ACUTE MASTOIDITIS IN CHILDREN: SUSCEPTIBILITY FACTORS AND MANAGEMENT

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ABSTRACT

The objective was to review our experience with clinical course, diagnostic and therapeutic profile of children treated for acute mastoiditis, and to investigate for possible susceptibility factors. Study was designed as retrospective review of pediatric patients presenting with acute mastoiditis secondary to acute otitis media over the last 6 years, from 2000 to 2006. The study involved children aged from 1 to 16 years treated for acute mastoiditis and subsequent intratemporal and intracranial complications in Clinic for otorhinolaryngology, Clinic Center Banja Luka. Selected clinical parameters, mastoid coalescence and risk factors for necessity of surgical intervention were analyzed. Medical history review of a total of 13 patients with acute mastoiditis was analyzed. Acute coalescent mastoiditis occurred 11 patients (84%) while noncoalescent form of acute mastoiditis occurred in 2 cases (16%). Intracranial complication occurred in 3 patients (2 meningitis and 1 peridural intracranial abscess), while 2 patients had intratemporal complication (subperiosteal abscess) associated to coalescent mastoiditis. We observed clinical profile of acute mastoiditis in regard to pathology found on the tympanic membrane, middle ear mucosa and destructions on the bony wall of the middle ear and mastoid. The main signs of progressive infection were tympanic membrane perforation, pulsatile suppurative secretion from the mucosa, and intratemporal abscess. All patients with coalescent mastoiditis required mastoidectomy, while noncoalescent mastoiditis was treated conservatively with broad-spectrum intravenous antibiotics and myringotomy. In conclusion acute mastoiditis is uncommon but serious complication of acute otitis media in children associated with significant morbidity. Coalescent mastoiditis concomitant with subperiosteal abscess, intracranial complications and mastoiditis not responsive after 48 hours to intravenous antibiotics should urge clinician to timely mastoid surgery.

KEY WORDS: mastoiditis, maternal sinus thrombosis, otitis media suppurative

INTRODUCTION

Acute mastoiditis was the most common complication of acute otitis media prior to the advent of antibiotics. Despite the significant decline in morbidity and mortality, acute mastoiditis still remains serious complication that could progress into life threatening intracranial complications (1,2). Acute mastoiditis could present in two clinical forms: noncoalescent and coalescent form. Inflammatory thickening of mucoperiosteal layer in mastoid antrum and cells complex characterizes noncoalescent mastoiditis, while the coalescent form progresses into destruction of bony walls of the mastoid process (1,2,3). Virulent bacteria and decreased immune response are the most common factors leading into intracranial progression of infection and the vast variety of intracranial complications (4,5,6), as purulent meningitis, lateral sinus thrombosis and intracranial abscess. In 2004, Niv et al. (7) evaluated clinical and data from 113 patients with 128 episodes of acute mastoiditis and concluded that one out of four children suffered from common variable immunodeficiency. A significant increase in the incidence of acute mastoiditis in infants was recorded over the 10 years study period. Leskinen (8) in a retrospective review of 33 children with acute mastoiditis established that 55% of patients were operated with signs of coalescence, endocranial or intratemporal complications. The aim of this study was to establish the clinical profile, treatment options and outcome of the child patients with acute mastoiditis in regards to socioeconomic background in Bosnia and Herzegovina.

PATIENTS AND METHODS

We performed a retrospective study of all pediatric patients who were treated for acute mastoiditis at the Otorhinolaryngology Clinic, Clinic Center in Banja Luka from 2000 to 2006. A total of 13 patients met the diagnostic criteria of acute mastoiditis. Standardized data forms were used to extract information for patients demographics, medical treatment, laboratory data and specimens, surgical intervention and outcome. The

diagnosis was based on clinical criteria which included presence of acute otitis media concomitant with, or preceding the onset of mastoid inflammation. Computed tomography scans were used to prove swelling of mastoid mucosa, or destruction of bony walls of mastoid process. Objective physical exam consisted of complete ear, nose and throat inspection, and review of tympanic membrane and mucosa of the middle ear if the tympanic membrane was perforated with microscope. The bacteriologic specimens were taken from patients if suppurative secretion was obtained through tympanic membrane perforation. Standard hematological tests were performed on admittance. Radiographic imaging of the mastoid process and intracranial space were conducted by computed tomography scans and in cases of intracranial complication (meningitis, lateral sinus thrombosis, and peridural intracranial abscess) magnetic resonance of the brain and intracranial space was obtained. In one case magnetic resonance imaging was backed up with contrast imaging of the intracranial venous sinuses. Therapy protocol for patients with acute mastoiditis was dependent on clinical stage and signs of association of intracranial or intratemporal complications. In cases with noncoalescent acute mastoiditis, intravenous wide spectrum antibiotics were administered for at least 7 days or until the complete resolution of inflammation in mastoid was obtained. Regular follow-up by physical otoscopy exam, hematological tests and repeated computed tomography if necessary were the basis for the clinician to estimate the resolution of the disease. In cases with coalescent mastoiditis, when objective signs of bony destruction of the mastoid process were established, concomitant intracranial or intratemporal complication was present, the indication for the operation was established. The procedure of choice was complete simple mastoidectomy. In cases where intracranial abscesses were found additional drainage of the abscess was established. If there was no improvement or the infection progressed after the 48 hours the patients with noncoalescent mastoiditis were referred to operative treatment. All the patients were followed up for 6 months after they were released from hospital. To evaluate data

Acute mastoiditis and complications	mastoiditis		Total
	coalescent	noncoalescent	
Meningitis	2	0	2
Peridural abscess	1	0	1
Subperiosteal mastoid abscess	2	0	2
Mastoid bony wall destruction	6	0	6
Mastoid mucoperiosteal inflammation	0	2	2
Total	11	2	13

TABLE 1. Clinical profile of noncoalescent and coalescent acute mastoiditis cases

Latency to the onset of acute mastoiditis				
Mastoiditis	3 - 5 days	6 - 14 days	15 - 21 days	Total
Coalescent and noncoalescent *	3	4	1	8
Endocranial complications †	1	2	0	3
Intratemporal complications ‡	0	2	0	2
Total	4	8	1	12
X² statistic	2,03			
p	0,7300			

* Cases of coalescent and noncoalescent mastoiditis without complications

† Cases of acute mastoiditis with endocranial complications

‡ Cases of acute mastoiditis with intratemporal complications

TABLE 2. Time gap from the onset of acute otitis to the acute mastoiditis

in regard to clinical profiles of acute mastoiditis, demographic profiles, therapy protocol and the treatment outcome we used nonparametric test Chi square test for independent samples. We evaluated significance of physical signs, and therapy protocols used to treat acute mastoiditis in relation to coalescent and noncoalescent form of acute mastoiditis. The statistical tests were calculated by Statistica 7 software on a personal computer.

RESULTS

Over the 6 years period follow-up we have treated 13 patients with acute mastoiditis, aged from 1 to 15 years (6,6 median). Coalescent type of acute mastoiditis was most frequent among children in age group 6 - 10 years (6 cases, 46%), and second most frequent group was 10 - 15 years (4 cases, 30,1%). Noncoalescent form of acute mastoiditis was typical in the youngest group of patients, 1 -5 years (2 cases). Clinical profiles of patients and concomitant endocranial and intratemporal complications are shown in Table 1. Acute coalescent mastoiditis occurred in 11 patients (84%), while noncoalescent form of acute mastoiditis was present in 2 cases (16%). Coalescent mastoiditis was frequently associated with endocranial complications. In two cases, purulent meningitis and in one case peridural abscess evolved from acute mastoiditis, while two patients had subperiosteal

tal mastoid abscess (intratemporal complication). Time that elapsed from the onset of acute otitis media to the onset of acute mastoiditis, that would be named latency period, is shown in Table 2. For 8 patients (61%) the average latency period, was 6 - 14 days, while the next frequent latency was 3 - 5 days in 4 cases (30,1%). There was no significant difference between the patients with coalescent mastoiditis and noncoalescent mastoiditis with regard to latency time $p=0,73$. Clinical profile established by otoscopy is shown in Table 3. We observed the differences in pathology on the tympanic membrane, middle ear, and bony wall of the external auditory canal. The defect of the external auditory canal was found in 1 case of coalescent mastoiditis and two cases with concomitant intracranial complication. Perforation of the tympanic membrane was common in a group with coalescent mastoiditis. Total of 8 patients (61%) had a tympanic membrane perforation, and 4 in this group had an associated destruction of the external auditory canal wall. Yet 4 patients had no perforation of the tympanic membrane, including one with meningitis. Magnetic resonance scan of a temporal bone and skull base of the patient with peridural abscess in the posterior cranial fossa associated to acute mastoiditis on the left side, is shown on the Figure 1. The image shows temporal bone destruction, abscess in the posterior cranial fossa that compresses the cerebellum. For the same patient, Figure 2. shows the magnetic resonance imag-

Mastoiditis			
Otoscopy findings	Coalescent and noncoalescent	Mastoiditis with complications	Total
Intact tympanic membrane	4	1	5
TM perforation *	3	2	5
TM perforation with EAC defect †	1	2	3
Total	8	5	13
X² statistic	1,73		
p	0,4204		

* Cases with tympanic membrane perforation

† Cases with tympanic membrane perforation and auditory canal wall defect

TABLE 3. Pathological findings in the middle ear of the acute mastoiditis cases

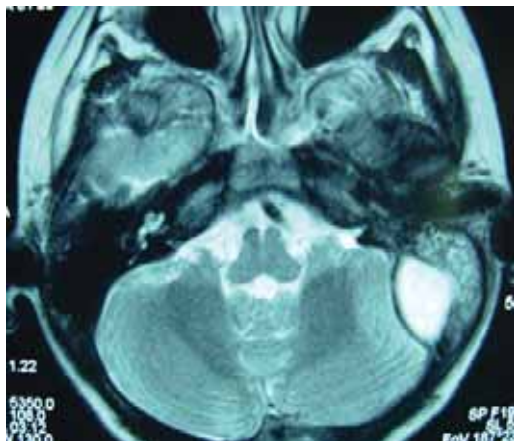


FIGURE 1. Magnetic resonance image of the posterior cranial fossa. Patient with peridural abscess secondary to acute mastoiditis on the right side.

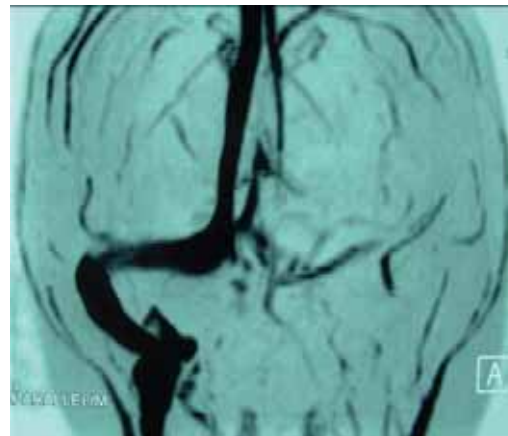


FIGURE 2. Magnetic resonance image of the endocranial sinuses. Angiography with contrast, showing the block of blood flow through lateral sinus, same patient.

ing scan with contrast applied in venous sinuses. Obstruction to the blood flow through the lateral sinus, and lateral sinus thrombosis, is prominent on the left side.

TREATMENT

Noncoalescent mastoiditis was treated with intravenous antibiotics and in one case myringotomy and insertion of ventilating tube. Therapy protocol is shown in Table 4. With regard to clinical profile and associated intracranial and intratemporal complications the indication for the operation was established. All patients with coalescent mastoiditis were subject to mastoidectomy, which was performed in 6 patients (46%). Tympanomastoidectomy was indicated in 2 cases (15.3%) with intracranial complications. Follow up that was performed repeatedly over the one to three months intervals, revealed no recurrence of the primary disease neither of the complications. There was no lethal outcome as well.

DISCUSSION

In this 6 years retrospective study we reviewed the evolution and clinical profile acute mastoiditis in children. Coalescent mastoiditis is considered a severely progressive inflammation of the mastoid process that represents continuation of acute otitis media. It's progression could turn into life threatening endocranial complications, meningitis, lateral sinus thrombosis and intracranial abscess. The introduction of antibiotic therapy, combined with mastoid surgery in selected cases, has dramatically reduced mortality of mastoiditis (4,5). Yet in the last decade numerous authors reported increase in incidence of acute mastoiditis in children (6,7). In our series the most common clinical signs of mastoiditis were retroauricular swelling and reoccurrence of middle ear inflammation following the initial onset of acute otitis media. Most of the patients had 2 or 3 episodes of acute otitis media preceding the onset of mastoiditis. Apparently,

Therapy procedure *	Mastoiditis		Total
	Coalescent and noncoalescent †	Mastoiditis with complications ‡	
Mastoidectomy	4	2	6
Tympanomastoidectomy	0	2	2
Mastoidectomy and endocranial abscess drainage	0	1	1
Ventilation tubes and antibiotics	4	0	4
Total	8	5	13
X ² statistic	7,37		
P	0,0611		

* Operations and procedures for patients with acute mastoiditis

† Cases of noncoalescent and coalescent mastoiditis without complications

‡ Cases of acute mastoiditis with endocranial or intratemporal complications

TABLE 4. Treatment procedures for patients with acute mastoiditis

the frequent relapses of the acute otitis could trigger progression of the infection in the acute mastoiditis, which also suggested Leskinen (8), Goldstein (9) and Osma (10). Most common clinical signs of coalescent mastoiditis that indicated osteomyelitic development in mastoid process were: tympanic membrane perforation associated with granulation tissue growth in the middle ear cavity, known as subperiosteal abscess in the posterior ear canal wall. There is a wide consensus among authors (10, 11, 12.) that operative treatment is obligatory if coalescent mastoiditis is present. Nonco-

alescent mastoiditis could be treated with antibiotics intravenously, usually cephalosporines of the third generation. If there were no clinical improvement over the 48 hours operative therapy is needed (4, 8, 11.). The rise of coalescent mastoiditis in our population dictated the need for mastoidectomy if at least one of the following criteria were met: presence of osteomyelitic infection in the mastoid process, subperiosteal mastoid abscess, endocranial or intratemporal complications secondary to acute mastoiditis, and clinical regression despite the antibiotic therapy in noncoalescent mastoiditis.

CONCLUSION

Acute mastoiditis is uncommon but serious complication of acute otitis media in children, associated with considerable morbidity. Early recognition based on clinical acumen is essential for effective treatment. Coalescent mastoiditis associated with intracranial or intratemporal complications should urge to timely mastoid operation.

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