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Artículo original

Acute mastoiditis in children: where do we stand?

Mastoidite aguda em crianças: ponto de situação

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Abstract

Background: Acute mastoiditis in children remains an otological challenge, assuming itself as the most frequent complication of acute otitis media. Although the use of antibiotic therapy has reduced the need for surgical intervention, the latter is frequently used in the treatment of acute mastoiditis and its complications. The objective of this study is to analyze the approach to acute mastoiditis nowadays using our experience in the Otorhinolaryngology department of Hospital Dona Estefânia, Lisbon, Portugal.

Material and Methods: We retrospectively studied the clinical charts of all children (n=226) with the diagnosis of acute mastoiditis admitted to our department during the period of 2000 to 2014 (15 years). Data regarding symptomatology, relevant findings of complementary exams, presence of complications and mainly therapeutic approach and their implications were studied.

Results: During the study period, 167 clinical records fulfilled criteria for inclusion. Boys (*n*=92) were much more frequently affected than girls. Their ages ranged from 1 month to 17 years (mean age 3 years and 7 months). History of previous acute otitis media episodes was registered in 41,3% (*n*=69) of patients. In our series, associated complica-

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tions (all present on admission) occurred in 27% of cases (*n*=45). All patients were submitted to empiric intravenous antibiotics. Surgical management included myringotomy (*n*=20) and myringotomy with transtympanic ventilation tubes (*n*=18) on admission upon the group without complications. A more agressive approach was undertaken in 45 children with associated complications. The mean length of hospital stay was 8.5 days. All patients recovered uneventfully. It was registered one recurrence of mastoiditis but the child was asymptomatic during the events.

Conclusion: Acute pediatric mastoiditis remains a potentially problematic infection even in the antibiotic era. According to recent literature, the incidence of this complication is increasing, which was not observed in our study. This entity should be the subject of clinical attention so that an appropriate therapeutic approach can be provided.

Keywords: acute mastoiditis, children, antibiotic, pediatric, otitis media

Resumo

Introdução: A mastoidite aguda em crianças permanece um desafio otológico, assumindo-se como a complicação mais frequente da otite média aguda. Embora a utilização de antibióticos tenha reduzido a necessidade de intervenção cirúrgica, esta é frequentemente a abordagem realizada no tratamento da mastoidite aguda e suas complicações. O objetivo deste estudo é analisar a abordagem da mastoidite aguda na atualidade, utilizando a nossa experiência no serviço de otorrinolaringologia do Hospital Dona Estefânia, Lisboa, Portugal.

Material e Métodos: Foram estudados retrospectivamente os procesos clínicos de todas as crianças (*n* = 226) com o diagnóstico de mastoidite aguda internados no nosso serviço no período de 2000 a 2014 (15 anos). Dados referentes à sintomatologia, achados relevantes de exames complementares, presença de complicações e principalmente abordagem terapêutica e suas implicações foram estudados.

Resultados: Durante o período do estudo, 167 doentes preencheram os critérios de inclusão. Os meninos (*n* = 92) foram muito mais afetados que as meninas. A idade das crianças variou entre 1 mês e os 17 anos de idade (média de 3 anos e 7 meses). A história de otite média aguda prévia ao episódio foi registrada em 41,3% (*n* = 69) dos doentes. Na nossa série, as complicações (todas presentes na admissão) ocorreram em 27% dos casos (*n* = 45). Todos os doentes foram submetidos a antibióticos intravenosos empíricos. A abordagem cirúrgica incluiu miringotomia (*n* = 20) e miringotomia com colocação de tubos de ventilação transtimpânica (*n* = 18) na admissão no grupo sem complicações. Uma abordagem mais agressiva foi realizada em 45 crianças com complicações associadas. O tempo médio de internamento hospitalar foi de 8,5 dias. Todos os doentes recuperaram sem intercorrências. Foi registada uma recidiva da mastoidite, porém a criança em questão esteve assintomática durante os eventos.

Conclusão: A mastoidite aguda pediátrica continua a ser uma infeção potencialmente problemática mesmo na era dos antibióticos. Segundo a literatura recente, a incidência desta patologia está a aumentar, o que não foi observado no nosso estudo. Esta entidade deve ser objeto de particular atenção médica para que

uma abordagem terapêutica apropriada possa ser fornecida a estas crianças.

Palavras-chave: mastoidite aguda, crianças, antibiótico, pediatria, otite média

Introduction

Acute mastoiditis in children remains an otologic challenge, and the most frequent complication of acute otitis media (AOM) with an estimated incidence from 1.2 to 4.2 / 100,000 children / year[1].

This inflammatory process must be treated effectively and without delays due to its potentially lethal complications.

Although the use of antibiotics have reduced the need for surgical intervention, mastoidectomy is the most reliable and effective surgical method to treat acute mastoiditis and its complications (intratemporal and intracranial). Even minor procedures such as myringotomy have been subject to debate, since intravenous antibiotic therapy is considered sufficient for the treatment of this pathology in some studies[2].

On the other hand, recently, the number of children admitted to some hospitals with acute mastoiditis has increased [3,4].

The treatment of mastoiditis is a controversial topic, since there are no established guidelines regarding this entity.

Our aim is to determine the therapeutic management of acute mastoiditis in Dona Estefânia Hospital, a tertiary pediatric otorhinolaryngology referral center, located in Lisbon, over 15 years.

Material and Methods

Revision of all clinical records of children (under 18 years old) diagnosed with acute mastoiditis admitted in our hospital between January 2000 and December 2014.

This was a retrospective and descriptive study regarding clinical presentation, relevant findings on laboratory or imaging exams, complications and especially therapeutic approach and its outcomes.

The diagnosis of acute mastoiditis was considered when the following criteria were present: retroauricular inflammatory signs, pinna protrusion and evidence of an AOM. A total of 226 patients fulfilled diagnostic criteria.

After the analysis of the 226 patients records, were considered as exclusion criteria the presence of: chronic cholesteatomatous otitis, external otitis or records with incomplete data. After considering all this exclusion criteria our final population included 167 patients. Our population included children until 17 years old since we are a pediatric tertiary referral center.

Statistical analysis with Excel® tools included the average, median, maximum, minimum and simple frequencies.

Results

During the study period, 167 clinical records fulfilled criteria for inclusion. Boys (*n*=92) were much more frequently affected than girls. Their ages ranged from 1 month to 17 years (mean age 3 years and 7 months) (Figure 1). Children younger than 3 years old represented more than half of cases (59,9%).

We verified that acute mastoiditis was more frequent in the winter (Figure 2).

There was a slight increase in the absolute number of patients in the last two years of our study (Figure 3).

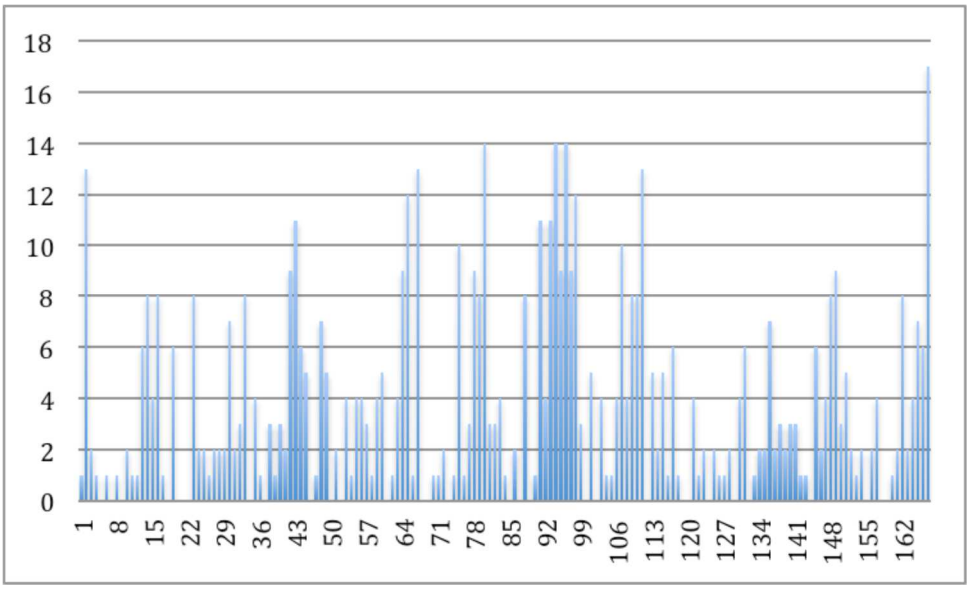

Figure 1: Distribution of cases by age (number of patients and age *per* months).

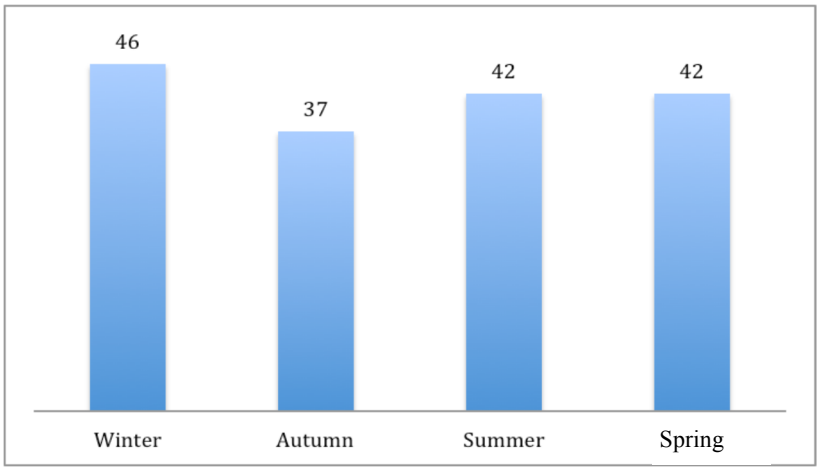

Figure 2: Distribution of cases by season.

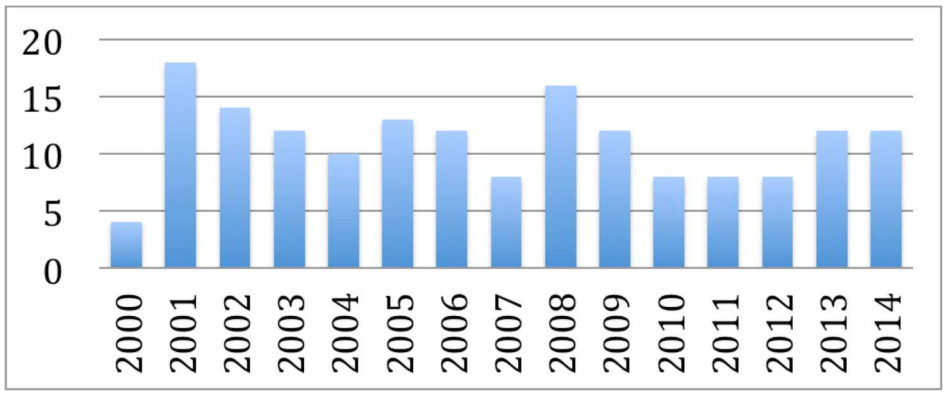

Figure 3: Distribution of cases by year of study.

History of previous acute otitis media episodes was registered in 41,3% (*n*=69) of patients. On admission the minority of patients were under antibiotic treatment (69 from all 167 cases included in the study) with amoxicillin-clavulanic acid (33 patients), amoxicillin alone (16 patients), second-generation cephalosporins (15 patients) or other antibiotics such as sulfamethoxazole-trimethoprim (2 patients), azithromycin (2 patients) and flucloxacilin (1 patient).

In our series, associated complications (all present on admission) occurred in 27% of cases (*n*=45), 36 presenting intratemporal complications (33 subperiosteal abscess and 3 facial paralysis) and 9 presenting intracranial complications (5 suffered lateral sinus thrombosis (LST), 3 had a subdural empyema associated with LST and 1 patient had meningitis and Gradenigo syndrome simultaneously). One of the five patients presenting with LST had extension of the trombophlebitic process to the homolateral internal jugular vein and cavernous sinus.

Bacteriologic evaluation of the aspirate of the middle ear, obtained by tympanocentesis or other surgical procedures, was performed in 44 samples, 26 were negative. *S. pneumoniae* (*n*=9) was the most common isolated microorganism. We also identified: *Pseudomonas aeruginosa* (*n*=5), *Streptococcus pyogenes* (n=1), *Proteus mirabilis* (n=1), *Klebsiella pneumoniae* (n=1) and *Staphylococcus cohnii* (n=1).

Computerized tomographic (CT) scans were obtained in 59 patients. Normal exams were reported in 34 children. These images were mainly performed when there was a clinical suspicion of an associated complication or a deterioration of the child's condition during treatment (abscess suspicion, fever persistence, neurologic symptoms).

Nine patients also performed magnetic resonance imaging (MRI) when an intracranial complication was suspected (by CT-scan images or clinical findings). Images were reported as normal in two patients. In five of these patients this exam shown LST (one patient being diagnosed on day 3 after admission by poor response to treatment). Another patient MRI images were compatible with meningitis and a third child presented a subdural empyema. This last patient had performed the MRI on day 5 after admission due to lack of response to treatment.

All patients were submitted to empiric intravenous antibiotics. Analgesics and antipyretics were given on

individual basis.

The majority of children (53,3%) were put on association therapy with a third-generation cephalosporin with good meningeal penetration and an anaerobic coverage (ceftriaxone and metronidazole or clindamycin were the most used combinations). Monotherapy was used in 46,7% of patients (ceftriaxone was the first choice). When a subdural empyema was diagnosed, vancomycin was also part of the treatment. The mean duration of antibiotherapy was 8.5 days.

Five of the eight children with LST, were put on enoxaparin and no complications were registered.

Surgical management included myringotomy (*n*=20) and myringotomy with transtympanic ventilation tubes (*n*=18) on admission upon the group without complications. A more aggressive approach was undertaken in 45 children with associated complications: in case of subperiosteal abscess, abscess drainage or/ and simple mastoidectomy was performed (abscess drainage was preferred as initial approach (*n*= 31)). Two children underwent simple mastoidectomy as initial approach to subperiosteal abscess and another two required simple mastoidectomy after unsuccessful drainage. In patients with facial paralysis (*n*=3) transtympanic ventilation tubes were inserted on admission. If an intracranial complication was diagnosed, simple mastoidectomy was the preferred treatment option (*n*=6). Two patients with LST were only submitted to myringotomy with insertion of transtympanic ventilation tubes with good response (Table 1). The only patient who didn't undergo surgery on this group (from the 9 with intracranial complications) was transferred to the pediatric intensive care unit due to an intravascular disseminated coagulation syndrome.

Table 1: Surgical management.

Surgical management	
Mastoidectomy	10 (2 after unsuccessful drainage)
Abscess Drainage	31
Ventilation tube	23
Myringotomy	20

The mean length of hospital stay was 8.5 days, with the minimum of 1 day (transferred to another hospital closer to home location) and maximum of 81 days.

Additional oral antibiotherapy was performed in 28% of patients after discharge (mainly with amoxicillin-clavulanic acid or cefuroxime) for an additional period of 8 to 10 days.

All patients recovered uneventfully. It was registered one recurrence of mastoiditis but the child was asymptomatic during the events.

All patients were submitted to follow-up evaluations every 2 weeks for at least 6 months without further registered events. No deaths were reported in the 15 years of this study.

Discussion

Depending on the presentation, extent of the disease, complications and personal experience of the surgeon, the approach of pediatric acute mastoiditis varies greatly among different reference centers.

Our series includes 167 cases in 15 years. As reported in other studies such as Spratley[5], boys are more affected then girls and young children represent a major part of the population involved. We are in agreement with Luntz and Spratley[3,5] in what concerns the fact that antibiotics prior to admission for AOM do not fully prevent an acute mastoiditis and when used they are selecting resistant microorganisms and maybe potentiating more complications. We identified 41,3% of patients that received antibiotics for AOM before admission.

The open access to the use of antibiotics and the understanding that nowadays the number of complications is higher than in the 1950s [6] make us question our options. Should we be more cautious with the prescription of antibiotics in AOM? Should we try to identify the pathogen and realize that empirical treatment is no longer acceptable? Our rate of complications was 27%. This percentage is comparable to the 22% reported by Luntz [3] in his recent large multicenter study.

Being aware of all the potential complications of acute mastoiditis, the modality of treatment becomes the central question. The absence of a treatment algorithm in this pathology turns experience into a valuable tool.

In our center 53,3% of patients were treated with combined antibiotics (preferably a third generation cephalosporin and clindamycin or metronidazol) and in our experience this is the most effective option. As referred by Psarommatis and co-workers [2], combined antibiotic therapy is a safer option for the patients than monotherapy, without necessarily having more adverse effects or a higher cost, because we reduce the risks of possible future complications. Briefly analyzing the patients with LST, anticoagulation therapy was used in 5 (out of 8). This is a controversial topic and few studies referred it. From our point of view, in agreement with our multidisciplinary team (ENT, Infectiologist, Pediatrician, Neurologist) the benefits can overcome the risks.

When considering surgical treatment we tend to focus on the specific patient circumstances.

As written by Psarommatis [2] "Currently, many researchers seem to adopt a conservative approach to pediatric mastoiditis which consists on antibiotics alone or antibiotics plus myringotomy when a poor response to antibiotics is observed". This seems to be our perspective too. In patients with acute mastoiditis without complications we only performed myringotomy in 31,3% of the cases, meaning that the majority overcome the disease without surgical procedures. From our experience the majority of patients with acute mastoiditis without complications tend to have good response to antibiotics and a close surveillance, without additional complications and reaching full recovery.

On the other hand, when dealing with acute mastoiditis associated with complications we tend, as most colleagues, to be more aggressive (7). We approach surgically 95,6% of the patients in this category.

From our point of view, and in agreement with Spratley and Psarommatis, [2,5,8], mastoidectomy is a delicate procedure in infants although remains the most effective procedure for the management of subperiosteal abscess. Following this rational, and considering the potential complications of the mastoidectomy in

young infants, we tend to prefer the drainage as the initial procedure in subperiosteal abscesses because its simple and risk-free, and reserve mastoidectomy for less-responsive cases.

When dealing with intracranial complications we consider that mastoidectomy should be performed as the initial procedure as the most effective approach in face of a life threatening situation, as also stated by Psarommatis and co-workers [2].

Based on our experience a close monitoring also plays an important role in the outcome of these children, so we always prefer inpatient care and we only discharge our patients after a near-normal ENT and neurologic evaluation. We reported a mean hospitalization stay of 8,5 days, comparable to Psarommatis[2] 9,8 days and Luntz[3] 9,1 days.

Conclusions

Acute mastoiditis in children remains a potentially life threatening condition although we have more antibiotic options than in the past.

A more conservative approach in acute mastoiditis without complications (combined antibiotherapy and close monitoring) can be a safe and successful scheme of treatment.

The more extensive surgical option should be taken on subperiosteal abscesses in case of poor response or worsening after 3-5 days of *iv* treatment, and when facing intracranial complications.

Standing as the most effective surgical procedure in acute mastoiditis, mastoidectomy should be performed when drainage in subperiosteal abscesses failed or intracranial complications are diagnosed.

Conflict of interest: The authors declare no conflict of interest.

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