



ORIGINAL ARTICLE

Mastoiditis diagnosed by clinical symptoms and imaging studies in children: Disease spectrum and evolving diagnostic challenges

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Background/Purpose: Acute mastoiditis has been increasingly reported. We reviewed our experience of mastoiditis in children in the era of expanding application of imaging tools and endless emerging antimicrobial resistance.

Methods: We reviewed all medical records of children (< 18 years of age) hospitalized with mastoiditis between January 2001 and December 2010. Diagnosis of mastoiditis was based on clinical features and confirmed by imaging studies. Patients were classified as having acute or nonacute mastoiditis according to the duration of the disease. Acute mastoiditis was defined as illness of less than 3 weeks prior to hospitalization. Cases of longer than 3 weeks' duration were defined as nonacute mastoiditis. We compared the clinical, laboratory and microbiological features of acute and nonacute mastoiditis.

Results: A total of 104 children were enrolled in this study, comprising 56 acute cases and 48 nonacute cases. Fever and coryza were significantly more common in acute cases. C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were both initially higher in acute mastoiditis. CRP, rather than ESR, declined faster in acute than in nonacute mastoiditis. Computerized tomography (CT) scans, but not plain films, were highly sensitive. *Streptococcus pneumoniae* and *Haemophilus influenzae* accounted for 52% of all isolates. Staphylococci, *Pseudomonas* spp. and polymicrobials were predominantly seen in non-acute mastoiditis.

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Conclusion: With the application of imaging studies, many cases of mastoiditis were identified. The classical postauricular signs were present in only 10% of patients. The presenting symptoms, inflammatory markers, pathogens, management and outcome were greatly influenced by the duration of the illness prior to admission.

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Introduction

In the pre-antimicrobial era, mastoiditis was the most common and feared complication of acute otitis media, and caused significant and even life-threatening complications beyond the tympanomastoid system, including subperiosteal abscess, Bezold's abscess, facial paralysis, suppurative labyrinthitis, meningitis, epidural and subdural abscess, brain abscess, and lateral sinus thrombophlebitis.¹

Since the introduction of antimicrobial therapy, incidence of mastoiditis and its complications have markedly reduced. However, an increase in incidence of acute mastoiditis has been noted in recent reports.^{2,3} Mastoiditis is more common in the pediatric age group, and most patients are younger than 4 years of age.^{4–8} The typical local signs of acute mastoiditis are postauricular pain, swelling, erythema and tenderness⁹; however, these classical signs are less common in the antimicrobial era, even in acute disease, which leads to difficulty in and delay of the diagnosis.⁷

In a recent systemic review of diagnostic criteria for acute mastoiditis in children, it was suggested that this disease is poorly evaluated and understood and there is lack of consensus regarding the criteria and strategies for diagnosing acute mastoiditis in the pediatric population.¹⁰ To date only scanty clinical and microbiological data on mastoiditis in children are available in Taiwan. Two reports on mastoiditis in Taiwanese children have been published over the past decade. Jiang et al reported 19 cases based on physical, imaging (eight patients) and surgical (six patients) findings and suggested that acute mastoiditis was uncommon, but its complications were high.⁸ In their series, 90.5% of cases had postauricular pain and over one-third of cases had underlying diseases. In contrast, Cheng et al reported that among 19 cases (15 patients underwent imaging studies), only six patients (32%) had postauricular swelling and tenderness.⁷ The article demonstrated a lack of typical physical findings in most cases of mastoiditis, and thus the authors suggested that mastoiditis was often overlooked by physicians.

The clinical spectrum and case definition of mastoiditis in children has evolved overtime. The availability of antibiotic therapy, imaging studies and preventive vaccines has had a great impact on the outcome and complications of this disease. Clearly, mastoiditis in children is not well understood and its clinical spectrum needs further delineation. This report describes our clinical experiences on 104 children with mastoiditis confirmed by clinical and computed tomography (CT) scans (97 patients) or plain films of mastoid region (seven patients). It discusses diagnostic challenges and provides comparative data on clinical, laboratory and microbiological features at acute and nonacute stages of the illness, and shares our approach to management of mastoiditis in children.

Methods

This retrospective study reviewed medical records on all patients less than 18 years of age who presented with the clinical diagnosis of mastoiditis to the Kaohsiung Veterans General Hospital (KVGH) from January 1, 2001 to December 31, 2010. The hospital is a tertiary referral medical center with 1200 beds, including 130 beds in the Department of Pediatrics, serving the population of Kaohsiung and surrounding communities of southern Taiwan.

Diagnosis of mastoiditis was established by both clinical features and imaging studies. Clinical features of mastoiditis included: fever, otalgia, otorrhea, postauricular inflammation (swelling, redness, tenderness) and antero-inferior displacement of auricle, eardrum abnormalities, and other nonspecific signs such as coryza, vomiting and poor appetite (Table 1). An increased soft tissue density in the mastoid air sinus by plain films or CT image was considered a positive finding. Patients with any one of the above clinical features plus positive findings on CT scan or plain films of mastoid region were enrolled in our study. Indications for obtaining imaging studies were based primarily on the judgment of the attending physicians. Patients with incomplete data or in whom the diagnosis was not conclusive were excluded. A total of 104 children meeting the diagnostic criteria were enrolled in this study.

The clinical course and spectrum of mastoiditis are poorly understood. Most papers refer to this clinical entity as "acute" mastoiditis. Clinical data on "subacute" or "chronic" mastoiditis are very limited. In contrast, otitis media is traditionally classified as acute (<3 weeks), subacute (3 weeks to 3 months) and chronic (>3 months) according to the clinical course of the disease.¹¹ In this study, we modeled otitis media and classified mastoiditis into acute (<3 weeks) or nonacute (>3 weeks) cases based on the duration of the disease (from onset of the illness to the time of diagnosis). We examined and compared the differences in clinical features, inflammatory markers, bacterial pathogens, and outcome between acute and nonacute mastoiditis. Recurrence within 3 months after completion of antibiotic therapy was defined as relapse; recurrence after 3 months was defined as reinfection. Relapse was considered to be the same episode as the previously recognized disease, and was regarded as treatment failure, while reinfection suggested a distinct episode. Images, microbiological and laboratory data, antimicrobial selection, medical or surgical intervention, and outcomes were also reviewed and recorded in a standard form.

The magnitudes of change in inflammatory markers, i.e., erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), leukocyte and neutrophil counts) during therapy were analyzed. The mean daily decrement of CRP or ESR,

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