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Pediatric recurrent acute mastoiditis: Risk factors and insights into pathogenesis



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ABSTRACT

Objectives: Recurrent acute mastoiditis is repeatedly reported in the literature, but data to understand the pathogenesis, update treatment recommendations and inform future trials are sparse due to the infrequency of the disease.

Methods: A retrospective chart review from 2001 to 2016 was conducted including 73 children treated for acute mastoiditis. A follow-up survey was attempted for each patient. Bacteriology, method of treatment, hospital course, complications, and otologic history were analyzed. A chi-squared test, Fisher's exact test and Mann-Whitney *U* test compared recurrent acute mastoiditis to single acute mastoiditis cases. Additionally, a comprehensive PubMed search and review of world literature addressing recurrent pediatric acute mastoiditis was performed for comparative purposes.

Results: Among 73 children with acute mastoiditis, six (8%) experienced recurrent acute mastoiditis. *Streptococcus pneumoniae* was the only bacteria isolated in this group. History of recurrent acute otitis media (> 4 per year) prior to the first episode of acute mastoiditis was identified in 24% with single episode of acute mastoiditis and 83% with recurrent mastoiditis ($p < 0.05$). Fewer intracranial/intratemporal complications were identified among recurrent mastoiditis patients ($p < 0.05$). In a group of patients treated with more extensive surgical communication during mastoidectomy for primary acute mastoiditis (wide mastoidectomy with broad attic exposure and posterior tympanotomy) no recurrence was observed.

Conclusion: We identify multiple risk factors associated with recurrence and provide early data supporting anatomic predisposition to the development of recurrent acute mastoiditis. More aggressive opening between the mastoid cavity and middle ear may prevent recurrent acute mastoiditis episodes.

1. Introduction

Acute mastoiditis (AM) is a middle ear infection that extends to the mastoid cells and involves the mastoid bone, leading to periostitis and/or osteitis. The major hypothesized cause of AM is lack of communication between the tympanic and mastoid cavities, preventing pus drainage through the Eustachian tube and/or tympanic membrane and leading to mastoid osteolysis and abscess formation. Although many studies have examined the etiology and treatment options for pediatric acute mastoiditis, little has been published about recurrent acute mastoiditis (rAM).

Primary AM has a reported incidence of 0.6–4.8 per 100,000 per year [1,2,3]. Recurrent episodes of mastoiditis are rare and account for

only a few percent of all AM cases, but are constantly present in major series of AM reported in the world literature, what makes them much more common than it is generally thought. rAM was first reported in 1910 by Mygind, who found that 4% of AM patients experienced recurrence [4]. William House reported recurrence rates of up to 20% in the pre-antibiotic era [5]. In the post-antibiotic era, rates of rAM range from 2 to 18%, with most series finding frequency of 5–10%. Variable treatments have been successfully applied ranging from antibiotics alone; myringotomy and tube placement with antibiotics; and mastoidectomy with tympanostomy tube placement and antibiotics (Table 1).

Despite recognition of rAM as an entity, there has been little published regarding the mechanism of development or factors that might predict or prevent rAM.

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Table 1
Comparison of reported cases of pediatric recurrent acute mastoiditis.

Author	Number of rAM/AM cases	First episode management of recurrent cases	Second episode management	Third episode management	Isolated pathogen	Number with history of recurrent acute otitis media	Number of post-cochlear implant patients
Present study	6/73 8%	5/6 mastoidectomy 1/6 conservative treatment	1/6 medical 5/6 mastoidectomy, posterior tympanotomy	1/1 remastoidectomy, posterior tympanotomy	First episode: 1- <i>Streptococcus pneumoniae</i> 4-Negative 1-Unknown Second episode: 4-Negative 1- <i>Streptococcus pneumoniae</i> 1- <i>Candida albicans</i> First episode: Pneumococci/Streptococci: 16/3	5/6	1
Groth et al. [6]	32/798 4%	24/32 mastoidectomy 8/32 IV antibiotics and myringotomy	2/32 remastoidectomy 26/32 antibiotics and myringotomy 4/32 mastoidectomy 4/5 antibiotics 1/5 aspiration	1/6 remastoidectomy 5/6 IV antibiotics and myringotomy	First episode: 6- <i>Streptococcus pneumoniae</i> 9- <i>Pseudomonas aeruginosa</i> 3- non-typable <i>Haemophilus</i> 15- anaerobes 4- no growth Second episode: 3- <i>Streptococcus pneumoniae</i> 5- <i>Pseudomonas aeruginosa</i> 2- non-typable <i>Haemophilus</i> 5- anaerobes 11- no growth No data	2/32	None
Lahav et al. [7]	5/78 6%	2/5 aspiration 3/5 mastoidectomy 5/5 IV antibiotics and myringotomy	4/32 mastoidectomy 4/5 antibiotics 1/5 aspiration	1/1 conservative treatment	No data	No data	None
Gavriel et al. [8]	22/434 5.1%	20/22 IV antibiotics and myringotomy 2/22 mastoidectomy	1/22 mastoidectomy 21/22 conservative treatment	None	First episode: 6- <i>Streptococcus pneumoniae</i> 9- <i>Pseudomonas aeruginosa</i> 3- non-typable <i>Haemophilus</i> 15- anaerobes 4- no growth Second episode: 3- <i>Streptococcus pneumoniae</i> 5- <i>Pseudomonas aeruginosa</i> 2- non-typable <i>Haemophilus</i> 5- anaerobes 11- no growth No data	No data	None
Zawawi (post-cochlear implant AM) [9] -review including Migrov study [10]	3/43 7%	No data	2/3 medical treatment 1/3 antibiotics and tympanostomy	None	No data	No data	3
Migrov (post-cochlear implant AM) [10]	2/11 18%	1/2 no data 1/2 incision and drainage	1/2 no data 1/2 IV antibiotics	None	No data	No data	2
Quesnel et al. [11]	8/188 4%	No data	No data	None	Second episode: 1- <i>Streptococcus pneumoniae</i> 1-Anaerobes 4-No growth No data	No data	None
Petersen [12]	3/79 4%	3/3 mastoidectomy	No data	None	No data	No data	None
Khaffi et al. [13]	11/134 8%	4/11 surgical treatment 7/11 conservative treatment	No data	2 cases	No data	No data	None
Glynn et al. [14]	2/29 7%	2/2 antibiotics	2/2 mastoidectomy	None	Second episode: 1- <i>Streptococcus pneumoniae</i> 1- no growth First episode: 1- <i>Haemophilus influenzae</i>	No data	None
Harley et al. [15]	1/57 2%	1/1 IV antibiotics, myringotomy and tube insertion, mastoidectomy	1/1 myringotomy and tube insertion	None	No data	No data	None
Lantz et al. [16]	11/223 5%	No data	No data	None	No data	11/11	None

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