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Bacteriology of mastoiditis
(A five-year experience at Groote Schuur Hospital)

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Introduction

Essential in the antimicrobial therapy for patients with mastoiditis is a comprehensive knowledge of the probable pathogens which may vary in different parts of the world. This knowledge allows a protocol to be evolved ensuring the best first-line therapy to be instituted before poor patient response or bacteriological analysis may indicate a change.

Although this disease is becoming less common and more benign, the potential complications should never be underestimated. It is useful to divide patients with symptoms and signs of acute mastoiditis into those without and those with cholesteatomas (acute-on-chronic mastoiditis).

Patients and methods

The records of 130 patients with acute and acute-on-chronic (cholesteatoma) mastoiditis managed at Groote Schuur Hospital between 1980 and 1984 inclusive were examined for bacteriological results. Of these patients, 74 had cholesteatomas and all were managed with intravenous antibiotics and early surgery.

Specimens for culture were obtained at the time of surgical drainage and were processed by the Bacteriology Laboratory at Groote Schuur Hospital according to standard laboratory protocol, which includes anaerobic culture.

Results

Culture results were available on 112 of the 130 patients (86.2%). Of those with bacteriology available, 42 were diagnosed as acute mastoiditis and 70 as acute-on-chronic mastoiditis.

Seventeen of the 112 specimens yielded no growth on bacteriological culture. Fifty-three yielded pure cultures and 42 mixed organisms. There were proportionately more pure culture results in the acute mastoiditis group (57.2%) than in the cholesteatoma group, in which mixed cultures made up 48.6% of the total (Table I).

The predominant organism isolated in the acute group was the group A steptococcus (Strep. pyogenes) followed by Streptococcus pneumoniae and Staphylococcus aureus (Table II): Anaerobes did not play a major role in this group of patients. In the chronic mastoiditis with cholesteatoma group, however, anaerobes made up almost 40 per cent of the organisms isolated, with Bacteroides fragilis being second only to Proteus mirabilis in numbers (Table III).

All Enterobacteriaceae isolated were sensitive to the aminoglycosides tested and most were sensitive to chloramphenicol. Streptococci, other than Enterococci, were sensitive to penicillin. There were no cloxacillin-resistant staphylococci isolated and all anaerobic organisms were metronidazole—sensitive. Both Haemophilus isolates were Ampicillin-sensitive. All the Proteus mirabilis strains and most of the Proteus sp strains were sensitive to amoxycillin/ampicillin.

Discussion

Organisms isolated from cases of mastoiditis can reasonably be expected to reflect the aetiological agents of middle ear infections. Acute otitis media is most commonly caused by Streptococcus pneumoniae and Haemophilus influenzae (Klein 1981).

Our results, however, show a high percentage of Group A streptococci isolated in cases of acute mastoiditis. This finding has been previously reported by

TABLE I

	No. of Patients	No growth	Pure	Mixed
Acute	42	10 (23.8%)	24 (57.2%)	8 (19%)
Acute-on-chronic (Cholesteatoma)	70	7 (10%)	29 (41.4%)	34 (48.6%)
Total	112	17 (15.2%)	53 (47.3%)	42 (37.5%)

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TABLE II
ORGANISMS ISOLATED FROM CASES OF ACUTE MASTOIDITIS

Organisms	Number of Isolates
Aerobes	
Grp A Streptococci	15
Strep. pneumoniae	7
Staph. aureus	6
Proteus mirabilis	4
Strep. viridans	1
Proteus vulgaris	1
Enterobacter	1
Anaerobes	
Bacteroides	4

TABLE III
ORGANISMS ISOLATED FROM CASES OF ACUTE-ON-CHRONIC

Organism	Number of Isolates
Aerobes	
Proteus mirabilis	37
Proteus sp	9
Pseudomonas aeruginosa	7
Streptococcus milleri	6
Enterococci	6
Staph. aureus	4
Esch. coli	4
Non-enterococcal grp. D Streptococci	3
B haemolytic strep (not grp A)	3
Proteus vulgaris	2
Haemophilus influenzae	2
Enterobacter sp	1
Serratia sp	1
Strep. pneumoniae	1
Anaerobes	
Bacteroides Fragilis	21
Bact. melaninogenicus	4
Bacteroides sp	3
Anaerobic cocci	3
Mixed anaerobes	3

Hawkins *et al.* (1983), and ascribed to the population they serve.

Other organisms isolated in this group are as expected; however, the presence of Staphylococcus aureus in six cases is important, as anti-staphylococcal agents are not routinely used as first-line therapy. Other authors have found even higher incidences of Staph. aureus (Pfaltz and Griesemer, 1984; Rubin and Wei, 1985) and the proper collection of material for bacteriological culture therefore becomes important for appropriate antibiotic therapy.

The correct choice of therapy in the rare cases of gram-negative bacillary (other than Haemophilus) acute mastoiditis is also important as these have been shown to have a higher rate of complications (Ostfeld and Rubinstein, 1980). The incidence of anaerobic organisms in this group was low, as has been previously reported (Ginsberg *et al.*, 1980; Hawkins *et al.*, 1983). At Groote Schuur Hospital, patients presenting with uncomplicated acute mastoiditis are initially treated with intravenous penicillin.

In patients with acute-on-chronic mastoiditis (cholesteatoma), Proteus mirabilis and Bacteroides fragilis often in mixed culture, were the most common bacteria isolated (Table III). This predominance of gram-negative bacilli is well recognized (Mawson and Ludman, 1979) and treatment is chosen to cover this spectrum. At Groote Schuur Hospital, the combination of intravenous ampicillin and metranidozole have proved the most effective first-line agents. While ampicillin is adequate for most Proteus mirabilis strains and also covers Enterococci and Streptococcus milleri, Enterobacteria other than Proteus mirabilis are rarely sensitive and Pseudomonas sp. are resistant. The importance of isolating Pseudomonas is highlighted by Fairbanks (1981) and in these patients the inclusion of an aminoglycoside has proved the most effective.

Pseudomonas was isolated in seven patients with cholesteatomas; four patients had temporal lobe abscesses, one a cerebellar abscess and one a posterior fossa extradural abscess and an empyema of the sigmoid sinus.

There was a close correlation between the bacteria isolated in patients with acute-on-chronic mastoiditis and those with intradural extension of the infection. In patients with otogenic intradural sepsis, chloramphenicol is added to ampicillin and metronidazole because of its wide bacteriostatic activity and excellent cerebral penetration.

It is important to note that Groote Schuur Hospital serves a large population, mainly from the lower socio-economic group and with limited exposure to previous antibiotics. The bacteriological spectrum in this series may well be different from that found in more sophisticated communities but the simple first-line antibiotic policy evolved by analysing the cultures and sensitivities of bacteria isolated in our community has proved effective in the majority of patients.

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