Chronic otorrhoea: Spectrum of microorganisms and antibiotic sensitivity in a South African cohort

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Background. Chronic otorrhoea is difficult to treat, with treatment in South Africa (SA) being protocol driven and generally initiated at the primary healthcare level. There is a lack of local studies that focus on the bacteriology and antimicrobial sensitivities of chronic otorrhoea, which underpins the management advice offered.

Aims. To determine the microbiological profile and antimicrobial susceptibility of patients with chronic otorrhoea and the validity of the Department of Health’s (DoH) current guideline.

Methods. We conducted a prospective study at Groote Schuur Hospital from 2005 to 2009. We included patients with chronic otorrhoea classified as either otitis media or otitis externa, according to our definitions. Pus swabs were taken, from which microorganisms were cultured and tested for antimicrobial susceptibility.

Results. Of 79 patients with otorrhoea, 50 had otitis media, 21 had otitis externa and the condition was not determined in 8 patients. The most common organism isolated with otitis media was *Proteus mirabilis* (18/50; 36%) and with otitis externa, *Pseudomonas aeruginosa* (7/21; 33%). Otorrhoea had a different microbial spectrum compared with international reports, with methicillin-resistant *Staphylococcus aureus* infection in a single patient. The organisms isolated were susceptible mainly to fluoroquinolones (96%) and aminoglycosides (81%).

Conclusion. Amoxicillin is a poor choice of antibiotic due to its low sensitivity, which calls into question the current DoH guideline for otorrhoea. Antimicrobial treatment protocols should be based on local data and be revisited from time to time. This study suggests that, should first-line treatment fail, an antibiotic with Gram-negative cover, e.g. a topical fluoroquinolone, should be considered.


Otorrhoea due to either external or middle-ear pathology is often difficult to treat. Different geographical areas may have unique patterns of infecting organisms and antimicrobial susceptibility. Worldwide, there has been a change in the profile of organisms causing otorrhoea and increases have been observed both in the incidence of methicillin-resistant *Staphylococcus aureus* (MRSA) and in resistance to antimicrobials.1 In South Africa (SA), patients with otorrhoea are often initially treated at the primary healthcare level. Otorrhoea is seldom investigated by microscopy, culturing or sensitivity testing; treatment is usually empirical and has limited options. Although treatment is protocol driven, a PubMed search failed to reveal SA studies focusing on the bacteriology and antimicrobial sensitivities of chronic otorrhoea underpinning the management advice offered.

Aims

To investigate the microbiology profiles of patients presenting to a tertiary hospital in Cape Town with chronic otorrhoea and to ascertain the validity of the current treatment protocol for chronic otorrhoea outlined by the SA Department of Health (DoH).

Methods

We conducted a prospective study at the tertiary-level Groote Schuur Hospital (GSH) in Cape Town over 4 years from 2005 to 2009. Patients with chronically discharging ears, who were referred to the Ear, Nose and Throat (ENT) Outpatients Unit by primary and secondary level services, were enrolled at their first visit to the hospital.

To best reflect the clinical situation at primary or secondary care level, we defined chronic otorrhoea as an ear discharge present for ≥2 weeks, either due to otitis media or otitis externa. We based the diagnosis of otitis media on the presence of a tympanic membrane (TM) perforation with the otorrhoea originating from the middle ear. We defined otitis externa as an intact TM and an inflamed, discharging lining of the external auditory canal. Our exclusion criteria included: patients with cholesteatoma, patients who had previous surgery, anatomical factors predisposing patients to recurrent ear infection, patients with foreign bodies, cerebrospinal fluid otorrhoea and patients who had received systemic or topical antibiotics in the 2 weeks prior to presenting to the hospital.

To obtain a representative sample of the ear discharge, ear toilet was first performed with a diagnostic microscope before a pus swab was carefully taken with a single mini-tip culture swab under direct microscopic vision. The swab was generally too big to pass through a TM perforation, and thus the discharge was sampled just lateral to the TM.

Pus swabs were analysed by GSH’s microbiology laboratory, a SA National Accreditation System accredited laboratory, within the National Health Laboratory Service (NHLS). Swabs were inoculated onto blood agar, boiled blood agar and MacConkey agar and incubated for up to 48 hours. Isolates were identified using standard laboratory techniques and antimicrobial susceptibility testing was performed using either the Vitek 2 system (bioMérieux, France) or standard Kirby Bauer disc diffusion test. Results were interpreted using Clinical and Laboratory Standards Institute (CLSI) guidelines.

Results

Seventy-nine patients met the inclusion criteria for the study with a mean age of 39 years (range 13 - 83 years). The female-to-male ratio
was 1.3:1 and the ratio of left to right ears was 1.2:1. Eight patients volunteered that they were HIV positive, 42 that they were negative and 35 did not know their HIV status. The duration of otorrhoea ranged from 4 to >100 weeks (mean 47 weeks). Otorrhoea had been present for >52 weeks in 34 (43%) patients.

Of the 79 patients enrolled in the study, 50 had otitis media, 21 had otitis externa and in 8 patients this distinction was not documented. In 31 patients the treatment that they had received prior to referral had been documented and included oral antibiotics, i.e. amoxicillin (n=24), ciprofloxacin (n=2), flucloxacillin (n=1) and amoxicillin-clavulanate (n=1). Five patients had received topical acetic acid drops, 2 of whom had also received amoxicillin.

*Proteus mirabilis* (36%; 18/50) was the most common isolate in otitis media while *Pseudomonas aeruginosa* (33%; 7/21) occurred most commonly in otitis externa (Table 1).

The patterns of susceptibility are listed in Table 2. MRSA, which was sensitive to most commonly in otitis externa, was detected in only 1 patient in Table 2. MRSA, which was sensitive to erythromycin, was detected in only 1 patient (with otitis media) – a 35-year-old HIV- positive patient with a 2-year history of otorrhoea.

**Discussion**

Our results describe the microbiology associated with chronic otorrhoea (both otitis externa and otitis media) in patients referred from primary and secondary healthcare facilities in the Western Cape. The most common organisms were *P. mirabilis* (29%), *P. aeruginosa* (20%) and *S. aureus* (15%). The microbiology associated with otitis media differed from otitis externa, with *P. mirabilis* (36%) and *P. aeruginosa* (33%) being the most common isolates, respectively (Table 1).

Our results roughly parallel the microbiology pattern reported by Lock et al. at another tertiary hospital in Cape Town in chronic otitis media patients, namely *Proteus spp.* (29%), *P. aeruginosa* (24%) and *S. aureus* (14%) as the most common. A problem when comparing our results with those of some other studies is that they refer to ‘chronic suppurative otitis media’, defined as ‘inflammation of the middle ear and mastoid process, accompanied by a perforated tympanic membrane and discharge’. In such studies, sampling would include otorrhoea (treatment of which is surgical) and non-cholesteatomatous ears. Although most studies indicate that only non-cholesteatomatous cases were included, this is not true for all reports. Although some African studies reported *P. mirabilis* to be the most common organism, other international studies report *S. aureus* and *P. aeruginosa* to be the most common organisms encountered with chronic suppurative otitis media. A recent Nigerian study reported that Gram-negative bacteria (*Klebsiella* spp., *Escherichia coli* and *P. aeruginosa*) comprised 80% of isolates. The microbiology with cholesteroloma is fairly similar, with a predominance of *P. aeruginosa* (31%) and *S. aureus* (19%), but there is also a significant anaerobic component.

The incidence of MRSA in Cape Town is low compared with other studies. In our study, MRSA was isolated in only 1 patient (1.7%) with otitis media for 2 years; it is not known what treatment the patient had received at primary care facilities. This is similar to the 1.9% incidence of MRSA reported by Lock et al. in patients with chronic active otitis media. These results differ from reports of changing bacteriological spectra and increases in the incidences of *S. aureus* and MRSA. Hwang et al. reported from Taiwan that, when compared with Juan (1986), there had been an 8.5% increase in the incidence of MRSA in acute otitis externa; they also reported an increase in MRSA with granular myringitis, and that the biggest change in microbiology profile – a 15% increase in MRSA – had occurred with chronic otitis media. Similar trends were observed in a large study from Korea, with the prevalence of MRSA increasing from 21.4% to 27.4%.

Hwang et al. postulated that the change from *P. aeruginosa* to *S. aureus*, especially MRSA, could be attributed to improvements in public healthcare, reduced severity of ear disease and a more liberal use of antimicrobial drug therapy. At primary care level, chronic otorrhoea is treated medically with ear toilet according

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**Table 1. Culture results**

<table>
<thead>
<tr>
<th></th>
<th>Otitis media (N=50)</th>
<th>Otitis externa (N=21)</th>
<th>All cases (N=79)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Proteus mirabilis</em></td>
<td>18 (36)</td>
<td>1 (5)</td>
<td>23 (29)</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>7 (14)</td>
<td>5 (24)</td>
<td>12 (15)</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>7 (14)</td>
<td>7 (33)</td>
<td>16 (20)</td>
</tr>
<tr>
<td>Other bacteria*</td>
<td>4 (8)</td>
<td>-</td>
<td>6 (8)</td>
</tr>
<tr>
<td>Fungal</td>
<td>-</td>
<td>1 (5)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Mixed growth/only skin flora†</td>
<td>14 (28)</td>
<td>7 (33)</td>
<td>21 (26)</td>
</tr>
</tbody>
</table>

*E. coli, Enterobacter cloacae, Alcaligenes faecalis.
† No distinct organism cultured.

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**Table 2. Antibiotic sensitivities of isolates from patients with otorrhoea for both otitis media and otitis externa**

<table>
<thead>
<tr>
<th></th>
<th><em>P. mirabilis</em> (N=23)</th>
<th><em>P. aeruginosa</em> (N=16)</th>
<th><em>S. aureus</em> (N=12)</th>
<th>Other organisms (N=6)</th>
<th>All organisms (N=54)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciprofloxacin</td>
<td>23 (100)</td>
<td>16 (100)</td>
<td>10 (83)</td>
<td>6</td>
<td>96</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>23 (100)</td>
<td>13 (81)</td>
<td>4 (33)</td>
<td>6</td>
<td>81</td>
</tr>
<tr>
<td>Amikacin</td>
<td>23 (100)</td>
<td>16 (100)</td>
<td>-</td>
<td>5</td>
<td>77</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>20 (87)</td>
<td>-</td>
<td>1 (8)</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>Amoxicillin/ clavulanate</td>
<td>23</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>41</td>
</tr>
<tr>
<td>Cefotaxime</td>
<td>23</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>41</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>22</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>39</td>
</tr>
<tr>
<td>Ceftazidime</td>
<td>-</td>
<td>16</td>
<td>-</td>
<td>6</td>
<td>39</td>
</tr>
<tr>
<td>Co-trimoxazole</td>
<td>14</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>32</td>
</tr>
<tr>
<td>Tobramycin</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>6</td>
<td>28</td>
</tr>
<tr>
<td>Oxacillin</td>
<td>-</td>
<td>-</td>
<td>11</td>
<td>-</td>
<td>19</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>-</td>
<td>-</td>
<td>11</td>
<td>-</td>
<td>19</td>
</tr>
</tbody>
</table>
Avoid getting the inside of the ear wet

Drug treatment

Amoxicillin
Penicillin allergy: Co-trimoxazole

SA = South African; DoH = Department of Health.

Table 3. Current SA DoH guideline for chronic otitis media[^10]

| Non-drug treatment | Avoid getting the inside of the ear wet
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Dry mopping</td>
<td></td>
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<tr>
<td>Topical 1% acetic acid or diluted vinegar solution</td>
<td></td>
</tr>
</tbody>
</table>

Amoxicillin appears to be a suboptimal choice for chronic non-responders due to its low sensitivity when compared with topical fluoroquinolone eardrops with ear mopping, which covers 95% of organisms cultured and is not ototoxic. Should the first-line treatment fail then an antibiotic group with Gram-negative cover should be considered.

Acknowledgement. This study was made possible by funding from the SA Society of Otolaryngology Head and Neck Surgery.

References


[^10]: Weber et al.[^10] showed that no significant antibiotic resistance emerged from the use of topical antibiotics.