

Isolation and Antimicrobial Susceptibility of Bacteria from Chronic Suppurative Otitis Media Patients in Kerman, Iran

K Mozafari Nia¹, G Sepehri^{2*}, H Khatmi³, MR Shakibaie⁴

¹Department of Otorhinolaryngology, Shafa Hospital, Kerman, Iran ²Department of Pharmacology, Neuroscience Research Center, Kerman, Iran ³Department of ENT, Physiology Research Center, Kerman, Iran ⁴Department of Microbiology, Kerman University of Medical Sciences, Kerman, Iran

Abstract

Background: Chronic supportive otitis media (CSOM) is one of the commonest illnesses in ENT practice. This study was conducted to find out the various aerobic microorganisms associated with CSOM and their current antimicrobial susceptibility patterns to commonly used antimicrobials.

Methods: samples were collected from 117 clinically diagnosed cases of CSOM and processed according to standard protocols.

Results: Out of 117 CSOM cases, 105 (86%) showed positive bacterial culture. The *Staphylococcus aureus* was the commonest aerobic isolate in CSOM. The sensitivity of *Staphylococci spp.* to commonly used antimicrobials varied from 27.2% for cefixime to 95.5% for gentamicin and coagulase positive. *Pseudomonas* isolates showed complete (100%) resistance to amoxicillin/clavulanate (co-amoxiclave), cloxacillin and cefixime, and high sensitivity to ciprofloxacin (95%) and cephalixin (90%).

Conclusion: An appropriate knowledge of antibacterial susceptibility of microorganisms would contribute to a rational antibiotic use and the success of treatment for chronic supportive otitis media.

Keywords: Chronic; Supportive; Otitis media; Antibacterial susceptibility; Iran

Introduction

Chronic supportive otitis media (CSOM) is the chronic inflammation of the middle ear and mastoid mucosa in which the tympanic membrane is perforated and discharges of grayish-white, homogeneous, turbid, and viscous secretions are present.¹⁻³ CSOM most often occurs in the first 5 years of life, and is common in developing countries, in special populations such as children with craniofacial anomalies and in certain racial groups.^{2,4}

The aerobic microorganisms most frequently isolated in CSOM are *Pseudomonas aeruginosa*, *Staphylococcus aureus*, Gram-negative organisms such as *Proteus spp.*, *Klebsiella spp.*, and *Escherichia spp.*, *Haemophilus influenzae*, and *Moraxella catarrhalis*.^{1,3,5} The most frequently isolated anaerobic organisms were *Bacteroides spp.* and *Fusobacterium spp.*^{5,6}

Since the bacteriology and antimicrobial susceptibility of CSOM infections were not determined in Iran, this study was performed to evaluate the antimicrobial susceptibility patterns among aerobic bacteria isolated from CSOM patients in ENT clinics in Kerman, Iran.

Since the bacteriology and antimicrobial susceptibility of CSOM infections were not determined in Iran, this study was performed to evaluate the antimicrobial susceptibility patterns among aerobic bacteria isolated from CSOM patients in ENT clinics in Kerman, Iran.

Materials and Methods

Samples were collected from 117 clinically diagnosed cases of CSOM by ENT specialists at private clinics and ENT educational clinics of Kerman University of Medical Sciences in Iran and processed according to standard protocols. CSOM was defined as otorrhea through a perforated tympanic membrane present for at least 2-6 weeks.^{2,3} Exclusion criteria were current febrile illness, current antibiotic use or use in the

*Correspondence: Gholamreza Sepehri, PhD, Professor of Pharmacology, Kerman Neuroscience Research Center, Jahad Blvd, PO Box: 76198-13159, Kerman, Iran. Tel: +98-341-2264196, Fax: +98-341-2264196, e-mail: gsepehri@yahoo.com
Received: May 22, 2011 Accepted: August 12, 2011

preceding 2 weeks, need for renal dialysis, recent ear surgery or an in-situ grommet or tympanostomy tube, mastoid surgery in the preceding 12 months, congenital ear or hearing problems, obstructed middle ear (eg, polyp) and pregnancy.

An ear swab was obtained by inserting a sterile swab deep in the ear canal and the discharges were added to Stuart transport medium and transported to a microbiology test laboratory. Organisms were identified using standard methods and API identification system (bioMérieux, Basingstoke, UK).⁷

Gram positive and gram-negative bacterial sensitivity of isolates to commonly used antimicrobials (gentamicin, ciprofloxacin, amoxicillin/clavulanate, (co-amoxiclave), cloxacillin, cefixime and cephalixin) were investigated by disk diffusion method using NCCLS guidelines.⁸ Data were analyzed by SPSS software (Version 16, Chicago, IL, USA).

Results

The culture samples of the 105 out of 117 patients were positive, yielding 128 bacteria. Fungi were iso-

lated in 21 patients (24.57%) and 12 patients (14.04%) had neither bacteria nor fungi infections (Table 1). *Staphylococci* species (50.3%) were the most prevalent microorganisms isolated followed by *Pseudomonas aeruginosa* (23.4%) (Table 1).

Table 2 shows the resistance rates of the main isolated pathogens (*Staphylococci* species and *Pseudomonas aeruginosa*, *proteus* and *Klebsiella*) from CSOM patients to commonly prescribed antimicrobials. The co-infection with several bacterial species (including *Staphylococcus aureus* and *Pseudomonas aeruginosa*) was seen in 11 (12.9%) patients (Table 1).

Sensitivity of coagulase negative *Staphylococci* spp. to commonly used antimicrobials varied from 33.3% for cefixime to 57.1% for cloxacillin and cephalixin (Table 2). *Pseudomonas* isolates showed complete (100%) resistance to amoxicillin/clavulanate (co-amoxiclave), cloxacillin and cefixime, but it showed high sensitivity to ciprofloxacin (95%) and cephalixin (95%) (Table 2). *Proteus* spp. showed relatively high sensitivity to ciprofloxacin (80%) and gentamicin (60%). Also co-amoxiclave, ciprofloxacin and gentamicin showed good antibacte-

Table 1: The bacteriological findings obtained from 117 CSOM^a patients

Species	No. of isolates	% of isolates
No growth	12	14.04
Coagulase (+) Staphylococcus	22	25.74
Coagulase (-) Staphylococcus	21	24.57
<i>Pseudomonas aeruginosa</i>	20	23.40
<i>Escherichia coli</i>	7	8.19
<i>Streptococcus</i>	6	7.02
<i>Proteus</i>	5	5.85
<i>Klebsiella</i>	5	5.85
<i>Enterococcus</i>	3	3.51
<i>Citrobacter</i>	2	2.34
<i>Enterobacter</i>	1	1.17
Fungi	21	24.57
Mixed Infection	11	12.9

^a CSOM: Chronic suppurative otitis media.

Table 2: Antibiotic susceptibility of isolated microorganisms from otorrhea in 117 CSOM patients to commonly used antimicrobials^a.

Species	CP	CFM	CO-AMOX	CLOX	GM	CF
Coagulase (+) Staph	85.4	27.2	63.6	81.8	95.5	90.9
Coagulase (-) Staph	52.4	33.3	52.4	57.1	47.6	57.1
<i>Pseudomonas</i>	95	0	0	0	85	5
<i>Proteus</i>	80	60	0	0	60	40
<i>Klebsiella</i>	60	20	80	20	60	40

^a CSOM: Chronic suppurative otitis media. CP: Ciprofloxacin, CFM: Cefixime, CO-AMOX: Amoxicillin/Clavulanate (Co-amoxiclave), CLOX: Cloxacillin, GM: Gentamicin, CF: Cephalixin.

rial activity against *Klebsiella spp.* (Table 2).

Discussion

The results of this study showed that *Staphylococcus aureus* was the commonest aerobic isolate in CSOM followed by *Pseudomonas aeruginosa* which is in agreement with the reports of some other investigators in different parts of the worlds, however, others reported that *Pseudomonas aeruginosa* was the commonest isolated microorganism in CSOM patients.^{1,3,5,9}

Streptococcus, *Proteus*, *Klebsiella*, *Enterococcus*, *Citrobacter*, *Enterobacter* and fungi were isolated in some CSOM patients which is comparable to the results of other investigators.^{5,6} The sensitivity of coagulase negative *Staphylococci spp.* to commonly used antimicrobials varied from 27.2% for cefixime to 57.1% for cloxacillin and cephalixin .However, coagulase positive *Staphylococci spp.* were more sensitive to commonly used antimicrobials and showed high sensitivity rates to gentamicin (95.5%), cephalixin (90.9%) and ciprofloxacin (85.4%). Clinical resistance of *Staphylococci spp.* to penicillin and other antimicrobial agents is now a problem throughout the world.¹⁰⁻¹²

Staphylococci spp. sensitivity to ciprofloxacin is in agreement with other reports and most of the investigators reported high sensitivity rate for *Staphylococci spp.* to fluoroquinolones such as ofloxacin and ciprofloxacin.^{5,10,13} *Pseudomonas* isolates showed complete (100%) resistance to amoxicillin/clavulanate (co-amoxiclave), cloxacillin and cefixime which is in contradictory to other reports, although some other investigators showed high resistance rate for *Pseudomonas* isolates to beta-lactam antibiotics.^{1,5,6,14}

Pseudomonas showed high sensitivity to ciprofloxacin (95%) and it was relatively sensitive to gentamicin (85%). High fluoroquinolones antibacterial activity against *Pseudomonas* isolates was reported by others, although resistant strains of *Pseudomonas* isolates to fluoroquinolones were detected in other studies.^{1,5,10,13}

Coagulase positive *Staphylococci* and *Pseudomonas* showed high sensitivity to gentamicin which is comparable to the results of Gul *et al.* (58%).^{1,15} Others reported a relatively low bacterial resistance to both coagulase positive *Staphylococci* and *Pseudomonas* isolates.¹⁴ The resistance to commonly used antimicrobials in Iran has been reported by other investigators too.¹⁶⁻¹⁸

In summary, the results of this study showed high resistance rate of *Staphylococci* and *Pseudomonas* isolates from CSOM patients to β -lactam and other commonly used antimicrobials. Therefore, an appropriate knowledge of antibacterial susceptibility of microorganisms may contribute to rational antibiotic use and the success of treatment for chronic suppurative otitis media.

Acknowledgments

This publication was supported by a grant from the Vice Chancellor of Research, Kerman University of Medical Sciences, Kerman, Iran. Also the authors thank Mr. Mehdi Addeli for his technical cooperation in data collection.

Conflict of interest: None declared.

References

- Gül HC, Kurnaz A, Turhan V, Oncül O, Pahsa A. Microorganisms isolated from middle ear cultures and their antibacterial susceptibility in patients with chronic suppurative otitis media. *Kulak Burun Bogaz Ihtis Derg* 2006;**16**:164-8. [16905907]
- Nelson JD. Chronic suppurative otitis media. *Pediatr Infect Dis J* 1988;**7**:446-8. [3293006] [http://dx.doi.org/10.1097/00006454-198806000-00033]
- Verhoeff M, van der Veen EL, Rovers MM, Sanders EA, Schilder AG. Chronic suppurative otitis media: a review. *Int J Pediatr Otorhinolaryngol* 2006;**70**:1-12. [16198004] [http://dx.doi.org/10.1016/j.ijporl.2005.08.021]
- Bluestone CD. Epidemiology and pathogenesis of chronic suppurative otitis media: implications for prevention and treatment. *Int J Pediatr Otorhinolaryngol* 1998;**42**:207-23. [9466224] [http://dx.doi.org/10.1016/S0165-5876(97)00147-X]
- de Miguel Martínez I, Del Rosario Quintana C, Bolaños Rivero M, Ramos Macías A. Aetiology and therapeutic considerations in chronic otitis media. Analysis of a 5 year period. *Acta Otorrinolaryngol Esp* 2005;**56**:459-62. [16425639]
- Saini S, Gupta N, Aparna, Seema, Sachdeva OP. Bacteriological study of paediatric and adult chronic suppurative otitis media. *Indian J Pathol Microbiol* 2005;**48**:413-6. [16761774]
- Dortet L, Legrand P, Soussy CJ, Cattoir V. Bacterial identification, clinical significance, and antimicrobial susceptibilities of *Acinetobacter ursingii* and *Acinetobacter schindleri*, two frequently misidentified opportunistic pathogens. *J Clin Microbiol* 2006;**44**:4471-8. [17050816] [http://dx.doi.org/10.1128/JCM.01535-06]
- Zapantis A, Lacy MK, Horvat RT, Grauer D, Barnes BJ, O'Neal B,

- Couldry R. Nationwide antibiogram analysis using NCCLS M39-A guidelines. *J Clin Microbiol* 2005; **43**:2629-34. [15956376] [http://dx.doi.org/10.1128/JCM.43.6.2629-2634.2005]
- 9 Miro N. Controlled multicenter study on chronic suppurative otitis media treated with topical applications of ciprofloxacin 0.2% solution in single-dose containers or combination of polymyxin B, neomycin, and hydrocortisone suspension. *Otolaryngol Head Neck Surg* 2000; **123**:617-23. [11077352] [http://dx.doi.org/10.1067/mhn.2000.107888]
- 10 Aslam MA, Ahmed Z, Azim R. Microbiology and drug sensitivity patterns of chronic suppurative otitis media. *J Coll Physicians Surg Pak* 2004; **14**:459-61. [15321034]
- 11 Borg MA, Cookson BD, Rasslan O, Gür D, Ben Redjeb S, Benbachir M, Rahal K, Bagatzouni DP, Elnasser Z, Daoud Z, Scicluna EA. Correlation between meticillin-resistant *Staphylococcus aureus* prevalence and infection control initiatives within southern and eastern Mediterranean hospitals. *J Hosp Infect* 2009; **71**:36-42. [19013679] [http://dx.doi.org/10.1016/j.jhin.2008.09.007]
- 12 Park DC, Lee SK, Cha CI, Lee SO, Lee MS, Yeo SG. Antimicrobial resistance of *Staphylococcus* from otorrhea in chronic suppurative otitis media and comparison with results of all isolated *Staphylococci*. *Eur J Clin Microbiol Infect Dis* 2008; **27**:571-7. [18299908] [http://dx.doi.org/10.1007/s10096-008-0478-6]
- 13 Macfadyen CA, Acuin JM, Gamble C. Systemic antibiotics versus topical treatments for chronically discharging ears with underlying eardrum perforations. *Cochrane Database Syst Rev* 2006. [16437533]
- 14 Shanthi M, Sekar U. Multi-drug resistant *Pseudomonas aeruginosa* and *Acinetobacter baumannii* infections among hospitalized patients: risk factors and outcomes. *J Assoc Physicians India* 2009; **57**:636-45.
- 15 Nyembue DT, Tshiswaka JM, Sabue MJ, Muyunga CK. Bacteriology of chronic suppurative otitis media in congolese children. *Acta Otorhinolaryngol Belg* 2003; **57**:205-8. [14571655]
- 16 Feizabadi MM, Etemadi G, Yadegarinia D, Rahmati M, Shabanpoor S, Bokaei S. Antibiotic-resistance patterns and frequency of extended-spectrum beta-lactamase-producing isolates of *Klebsiella pneumoniae* in Tehran. *Med Sci Monit* 2006; **12**:BR362-5. [17072265]
- 17 Hadadi A, Rasoulinejad M, Maleki Z, Yonesian M, Shirani A, Kourorian Z. Antimicrobial resistance pattern of Gram-negative bacilli of nosocomial origin at 2 university hospitals in Iran. *Diagn Microbiol Infect Dis* 2008; **60**:301-5. [18036759] [http://dx.doi.org/10.1016/j.diagmicrobio.2007.10.010]
- 18 Kalantar E, Mosaei M, Ekrami A, Pedram M. Isolation and antimicrobial susceptibility of bacteria from external ear canal of cancer patients at Shafa Cancer Hospital-Ahwaz. *J Cancer Res Ther* 2006; **2**:17-9. [17998667] [http://dx.doi.org/10.4103/0973-1482.19769]