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Community-acquired Methicillin-resistant Staphylococcus Aureus Infections in Discharging Ears

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Objectives—Although community-acquired methicillin-resistant Staphylococcus aureus (MRSA) infections have recently become an increasing problem in various fields of medicine, they have rarely been studied in the ear. The purpose of this study was to determine the prevalence of community-acquired MRSA infections in discharging ears and to compare the epidemiology of MRSA with that of other pathogens.

Material and methods—Between August 2000 and February 2002, 248 isolates recovered from 221 discharging ears of patients with 3 disease entities (chronic otitis media, acute otitis externa and granular myringitis) were prospectively analyzed using bacteriology. The isolates analyzed using bacteriology were divided into three groups: MRSA, methicillin-susceptible S. aureus (MSSA) and non-SA.

Results—S. aureus was found in 108 (43.5%) isolates and MRSA in 27. Therefore, the percentage of MRSA among the S. aureus isolates was 25.0% (27/108). The prevalence of community-acquired MRSA infections in discharging ears was 12.2% (27/221) and the MRSA strains were highly susceptible to vancomycin, teicoplanin, fusidic acid and minocycline. The MRSA-infected patients were older than those infected with other groups of pathogens. Also, MRSA infections appeared to be more common in chronic otitis media than in acute otitis externa or granular myringitis.

Conclusions—Community-acquired MRSA represents an increasing problem. In this study, MRSA strains were highly susceptible to vancomycin, teicoplanin, fusidic acid and minocycline. *Key words: bacteriology, community-acquired MRSA, drug sensitivity, otorrhea.*

INTRODUCTION

Staphylococcus aureus is one of the commonest pathogens encountered in various hospital- and community-acquired infections. Shortly after the introduction of penicillin in the 1940s, penicillinase-producing strains appeared. The semi-synthetic penicillin, methicillin, was introduced later with good results. However, in 1961, the first strains of methicillin-resistant S. aureus (MRSA) were noted (1). MRSA infections subsequently became a growing problem. The proportion of nosocomial S. aureus isolates that were methicillin-resistant increased worldwide from 2% in 1974 to $\approx$ 50% in 1997 (2). A similar trend has also been found in Taiwan during the past 10 years (3). The prevalence of community-acquired MRSA infections has also been rising recently (4, 5). Although the bacteriology of chronic otitis media, acute otitis externa and granular myringitis has been investigated extensively by authors in various geographic locations, community-acquired MRSA infection in discharging ears has not previously been reported. Therefore, the purpose of this study was to determine the prevalence of community-acquired MRSA infections in discharging ears and to compare the epidemiology of MRSA with that of other pathogens. In addition, the drug susceptibility of MRSA isolates was also studied.

MATERIAL AND METHODS

This study was carried out prospectively on 221 consecutive outpatients (118 males, 103 females; age range 1–85 years) presenting with otorrhea between August 2000 and February 2002. All of these patients denied hospitalization before the onset of otorrhea. The discharge for bacteriologic culture was obtained as follows: excess drainage was removed from the external auditory canal with a sterile cotton pledget on an ear probe and the bacteriologic specimens were taken near the tympanic membrane using a sterile cotton swab. They were then inoculated into culture media separately for aerobic and anaerobic cultures. Specimens were processed and identified using conventional methods. The susceptibility of the isolated organisms to antimicrobial agents was tested using the Kirby–Bauer method. Only cultures that revealed moderate to heavy amounts of bacterial growth were considered significant and included in the study. At the same time, the status of the tympanic membrane was inspected by the senior otologist to determine the disease entity, either chronic otitis media (COM), acute otitis externa (AOE) or granular myringitis (GM). All cases could be classified into one of these three disease categories, i.e. there were no cases of acute otitis media with pus discharge or chronic otitis externa in our series. COM was defined as a persis-

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Table I. *Age distributions of patients in the three pathogen groups. The values shown represent the numbers of isolates, with percentages in parentheses*

Pathogen group	Age (years)				Total
	<20	21–40	41–60	>61	
MRSA	1 (3.7)	4 (14.8)	8 (29.6)	14 (51.9)	27 (100)
MSSA	7 (9.8)	30 (42.3)	18 (25.4)	16 (22.5)	71 (100)
Non-SA	22 (18.0)	25 (20.3)	34 (27.6)	42 (34.1)	123 (100)

Table II. *Comparison of prevalence of MRSA and other pathogens in various disease entities. The values shown represent the numbers of isolates, with percentages in parentheses*

Pathogen group	COM	AOE	GM	Total
MRSA	18 (13.6)	6 (9.8)	3 (10.7)	27 (100)
MSSA	34 (25.8)	23 (37.7)	14 (50.0)	71 (100)
Non-SA	80 (60.6)	32 (52.5)	11 (39.3)	123 (100)
Total	132 (100)	61 (100)	28 (100)	221 (100)

tent tympanic membrane perforation for >3 months. None of the COM patients in our study had a middle ear ventilation tube in place.

RESULTS

A total of 248 isolates were recovered from the 221 cultures. S. aureus was found in 108 (43.5%) isolates and non-S. aureus in 140 (56.5%). MRSA was found in 27/221 cultures, i.e. the proportion of MRSA among the S. aureus isolates was 25.0% (27/108). The prevalence of community-acquired MRSA infections in discharging ears was 12.2% (27/221).

Pseudomonas aeruginosa, which was found in 76 (30.6%) isolates, was the commonest pathogen in the non-S. aureus groups. The mean age of the patients in the MRSA group was 51.0 years (range 4–78 years); 13 patients were male and 14 female. Mixed infection (2 isolates of MRSA and P. aeruginosa) was recovered in 1/27 cultures. The MRSA-infected patients were older compared with those infected with the other pathogen groups (Table I). The male:female ratio for the MRSA-infected patients was 0.9:1; in contrast, male patients were more common in the MSSA (1.3:1) and non-SA groups (1.2:1). Table II summarizes the prevalence of MRSA and other pathogens in various disease entities. Community-acquired MRSA infections appeared to be more common in COM than in AOE or GM (13.6% vs 9.8% vs 10.7%, respectively). There was a higher proportion of irradiated ears in the MRSA group (11.1%) compared to the MSSA (4.2%) and non-SA (3.3%) groups (Fig. 1). The susceptibility of MRSA to various antibiotics is shown in Table III. MRSA was highly susceptible to vancomycin, teicoplanin, fusidic acid and minocycline. However, the sensitivity of MRSA to gentamicin, clindamycin and erythromycin was very low.

DISCUSSION

The incidence of hospital-acquired MRSA infections in the ear has increased a lot recently. Kao and Shiao

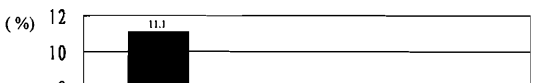

Fig. 1. Percentages of irradiated ears in the three pathogen groups.

Table III. *Susceptibility of MRSA to various antibiotics*

Antibiotic	Susceptibility; *n* (%)
Vancomycin	27/27 (100%)
Teicoplanin	27/27 (100%)
Minocycline[a]	26/27 (96.3%)
Fusidic acid[a]	26/27 (96.3%)
Gentamicin	10/27 (37.0%)
Clindamycin[a]	4/27 (14.8%)
Erythromycin[a]	3/27 (11.1%)

[a] Oral form was available.

(6) reported that the proportion of hospital-acquired MRSA infections in S. aureus-infected ears was 37.5% (15/40). In another study (7), of 265 positive cultures obtained after middle ear surgery, MRSA was the commonest organism, being found in 94 cases (34.7%). In our study, we showed that the prevalence of community-acquired MRSA infections in discharging ears was 12.2%, indicating that community-acquired MRSA infections represented an increasing problem during the study period.

Previous reports of community-acquired MRSA infections were often linked to i.v. drug abuse, cystic fibrosis, chronic diseases and repeated antimicrobial therapy (8–10). Recent reports have shown that the prevalence of community-acquired MRSA infections without identified risk factors in both adults and children has also increased (4, 11). Moreover, Moreno et al. (5), in a case-controlled study, reported that patients with community-acquired MRSA isolates were indistinguishable from those with community-acquired MSSA isolates in terms of age, sex, risk factors, etc. Gottlieb et al. (11) reported several cases of community-acquired MRSA infections in otolaryngologic settings, including COM and AOE. The most common diagnosis was otitis externa and none of the infections were linked to i.v. drug use. Additionally, no patient was known to be a healthcare worker. Santos et al. (12) also reported three pediatric patients with community-acquired MRSA otologic infections, including otitis externa, otitis media and acute mastoiditis. All three patients demonstrated familial patterns of transmission without any risk factors. Our cases were also not significantly linked to known risk factors.

Nosocomial MRSA tended to exhibit multiple antibiotic resistance patterns. In contrast, community-acquired MRSA is generally susceptible to a greater number of antibiotics (10, 11). Community-acquired MRSA isolates obtained from children with an identified risk were more resistant to drugs such as erythromycin, clindamycin, gentamicin, trimethoprim–sulfamethoxazole, etc. than those without an identifiable risk (4). In our patients, resistance to erythromycin, clindamycin and gentamicin was still high although there was no known risk factor in these patients. In the literature, the susceptibility of MRSA to new quinolone otics remains controversial. Ikeda and Takasaka (13) reported that otic drops containing new fluorinated quinolones, ofloxacin and NY-198 demonstrated high in vitro activity against MRSA organisms causing purulent otitis media. However, MRSA organisms still occurred in 34.7% of all postoperative infections despite the use of ofloxacin-soaked packing (7). Also, resistance of MRSA to ciprofloxacin has been reported by several investigators (14). In our study, the susceptibility of MRSA to new quinolones was not investigated. Therefore, whether ofloxacin otic alone is currently an effective treatment for MRSA otorrhea remains unclear. More studies need to be done in the future to resolve this issue.

There are no published treatment guidelines for patients presented with MRSA otorrhea. In the opinion of Brumfitt and Hamilton-Miller (15), vancomycin remains the treatment of choice for MRSA infections. Other drugs have not proved to be clinically effective in eradicating MRSA. However, the drawbacks of treatment with vancomycin or other i.v. antibiotics include cost, adverse effects, toxic reactions and inconvenience for outpatients. In most cases of MRSA otorrhea, no oral form antibiotics were used before coming to our clinic. Some of them had used Sofradex or ofloxacin otic for 1 week. These patients did not show an obvious reduction in otorrhea after local treatment and further ototopical medications. Fusidic acid or minocycline, combined with ofloxacin otics, was tried in these patients after culture confirmation and led to complete remission of otorrhea within 2 weeks; i.v. antibiotics were not needed. Therefore, we suggest that this regimen should be the first choice in MRSA infections in discharging ears.

Finally, MRSA colonization may be widespread. The role that increased antibiotic use, particularly beta-lactams and cephalosporins, plays in selecting MRSA strains in the community is unknown. More surveillance is needed in order to characterize and monitor community-acquired MRSA infections in the ear and to develop strategies, especially ototopical antibiotics, that will improve MRSA treatment and control.

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