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Short report

Investigation of nasal meticillin-resistant *Staphylococcus aureus* carriage in a haemodialysis clinic in Japan☆

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SUMMARY

Patients and healthcare workers in a Japanese haemodialysis clinic were investigated for nasal carriage of meticillin-resistant *Staphylococcus aureus* (MRSA). MRSA carriage was found in 10 (8.9%) of 112 patients in the first year and four (3.9%) of 103 patients in the second year. All isolated MRSA samples carried staphylococcal cassette chromosome *mec* type II or III and classified as clonal complex 5, which were common as healthcare-associated strains. Pulsed-field gel electrophoresis indicated horizontal transmission limited to two pairs of patients in one session. One of 54 healthcare workers carried MRSA genetically unrelated to patients' strains. Infection control measures based on the US Centers for Disease Control and Prevention's recommendation showed limited spread of MRSA in a haemodialysis room.

Introduction

Nasal carriage of community-associated meticillin-resistant *Staphylococcus aureus* (MRSA) infection among haemodialysis patients has been increasing in many countries in the early twenty-first century.[1,2] The aim of this study was to determine prevalence of MRSA carriage, molecular types and actual pattern of transmission in a typical haemodialysis clinic in Japan.

Methods

Swab sampling of bilateral anterior nares was performed from all patients and healthcare workers in a haemodialysis clinic in Saitama prefecture, Japan. Each patient belonged to one of the three haemodialysis sessions. The first sampling from patients was carried out from 3 February to 30 May 2009 and the second was from 9 February to 10 April 2010. Sampling from healthcare workers was performed from 4 August to 8 September 2010.

☆ This article is dedicated to the late Dr M. Takeuchi.

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Table I
Data on MRSA strains: sampling periods, haemodialysis sessions, patient numbers and strain numbers

	Session 1			Session 2							Session 3				HCW
	1[a]	2[a]		3[a]	4[a]		5[a]		6[a]	7[a]	8[a]	9[a]	10[a]	11[a]	
	1st[b]	1st[b]	2nd[b]	1st[b]	1st[b]	2nd[b]	1st[b]	2nd[b]	1st[b]	1st[b]	1st[b]	1st[b]	1st[b]	2nd[b]	
Strain name	1F	2F	2S	3F	4F	4S	5F	5S	6F	7F	8F	9F	10F	11S	CE1
SCC*mec*	IIa	IIa	IIa	IIn	IIa	IIa	III	III	IIn	IIa	IIa	IIa	IIn	IIa	IVn
ST	5	5	5	5	5	5	764	764	5	5	5	5	5	764	8
CC	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

MRSA, meticillin-resistant *Staphylococcus aureus*; HCW, healthcare worker; SCC*mec*, Staphylococcal Cassette Chromosome *mec*; ST, sequence typing; CC, clonal complex; n, unknown subtype.
[a] Patient number.
[b] Sampling period.

Culture of swabs, isolation and identification of MRSA by polymerase chain reaction, determination of staphylococcal cassette chromosome *mec* (SCC*mec*) type, sequence type (ST) and clonal complex (CC) of MRSA strains were performed as previously reported.[3–6]

Pulsed-field gel electrophoresis (PFGE) was performed as previously described.[7] Strains sharing more than 70% of their bands were considered as 'genetically related' by BioNumerics software version 2.5 (Applied Maths, Sint-Martens-Latem, Belgium).

Prevalence of MRSA carriers and molecular types of MRSA strains were compared between the two sampling periods. MRSA transmission between the carriers was also evaluated.

This study was approved by the ethics committee of Juntendo University School of Medicine (No. 20044). Written informed consent was obtained from all the participants.

Results

In the first sampling from 112 patients, 29 (25.9%) carried *S. aureus* including 10 (8.9%) MRSA carriers. Eighteen patients died or moved to other clinics and nine new patients came to the clinic between the first and the second samplings, so the second sampling had 103 patients: 27 (26.2%) carried *S. aureus* with four (3.9%) MRSA carriers. Between the two samplings, one MRSA carrier died and the other moved to another hospital. Of the remaining eight carriers, three were repeatedly positive for MRSA. In addition, one patient became newly positive for MRSA. Among 54 healthcare workers, only one clinical engineer carried MRSA (1.9%).

SCC*mec* type, ST and CC are shown in Table I. In the first sampling period, nine MRSA strains were typed as SCC*mec* type II and ST5. The unique strain 5F was SCC*mec* type III without mercury component, and ST764.[8] Both ST5 and ST764 belonged to CC5. In the second sampling period, three patients (2, 4 and 5) carried MRSA with the same SCC*mec* types and STs as the first sampling. The strain 11S isolated from a new carrier had SCC*mec* type II but was ST764. The strain from a clinical engineer, CE1, was typed as SCC*mec* type IV and ST8.

Analysis of the PFGE patterns is shown in Figure 1. Three clusters were recognized as genetically related. 5F and 11S had unique ST though they showed related pattern to 3F and 6F. 5F was also discriminated from 11S by different SCC*mec* types. In session 2, two pairs of the patients (patients 3 and 6, and patients 4 and 7) carried genetically related MRSA strains, but they did not share haemodialysis beds or equipment. The strains from patients 3, 6 and 7 were not detected in the second sampling. CE1 was not related to the patients' strains though clinical engineers had patient contact, for example by puncturing arteriovenous fistula.

Discussion

Previous reports during the 2000s showed prevalence of MRSA carriers ranging from 2.3% to 12.0%.[1,9] Recently, SCC*mec* type IV, typical as community-associated MRSA, is the commonest among haemodialysis patients in Taiwan and the USA.[1,2] In this study the prevalence of MRSA seemed to be equivalent to that in other countries, but most of all MRSA strains from patients were differentiated as SCC*mec* type II or III and CC5, the major healthcare-associated MRSA in Japan.

The US Centers for Disease Control and Prevention (CDC) supplied the recommendation for preventing transmission of infections among chronic haemodialysis patients in 2001.[10] Infection control procedures in this clinic were based on CDC's recommendation except that blood pressure cuffs, stethoscopes and linens were not changed after each use, and decolonization of MRSA was not performed to prevent emergence of mupirocin resistance. Horizontal transmission of MRSA among the patients seemed limited and infection control procedure in this clinic is sufficient to prevent overt MRSA transmission.

In conclusion, carriage of healthcare-associated MRSA strains was dominant in a typical haemodialysis centre in Japan, but horizontal transmission of MRSA among the patients and healthcare workers was limited following CDC's recommendation.

Conflict of interest statement
None declared.

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