

Methicillin-Resistant *Staphylococcus aureus* Bacteremia (SAB): Age-Related Trends in the Prevalence of SCCmec types Over 11 Years

R. Khatib, M. Sharma, L.B. Johnson, K. Riederer, S. Shemes, K. Cruz
St. John Hospital and Medical Center, Detroit, MI



Abstract

Background: Community-associated MRSA isolates (CA-MRSA; prototype SCCmec type IV) emerged among children and young adults about 13-14 years ago. They spread rapidly and entered healthcare settings. Whether the spreading rate of CA-MRSA is age linked is unknown.

Methods: Retrospective review of adult (≥ 18 y) inpatients with SAB during 4 periods: 11/2002-6/30/2003, 11/1/2005-12/31/2006, 7/15/2008-12/31/2009, and 7/15/2010-12/31/2012. SCCmec type of MRSA isolates was defined by multiplex primers (Applied Biosystems, Foster City, CA). The prevalence of MRSA SCCmec II and IV was stratified according to patient age and year of the study.

Results: We encountered 1262 episodes of SAB among 1226 patients, (their 1st episode only was included), 718 (58.6%) were caused by MRSA SCCmec III/III and IV/IV accounted for 402 (56.0%) and 199 (27.7%) isolates, respectively. SCCmec IV/IV increased (6.1, 23.0, 19.9, and 26.0% in year 2002-3, 2005-6, 2008-9, and 2010-12, respectively; $p < 0.0001$) and SCCmec III/III decreased (42.9, 38.1, 31.8, and 30.8%, respectively; $p < 0.0001$) over time. Stratifying the results according to patient age and study year showed significant changes in all age groups but was most apparent in patients ≥ 65 y.

Conclusions: The elderly with SAB are at increasing risk for CA-MRSA, genotypes probably because of its introduction into healthcare settings and persistence in the community. Whether CA-MRSA isolates eventually replace HCA-MRSA remains to be determined.

Introduction

Community-associated MRSA isolates (CA-MRSA; prototype SCCmec type IV) have emerged as a major cause of soft tissue and respiratory tract infections among children and young adults and now account for a sizable portion of healthcare-associated (HCA) infection. Whether risk in the elderly for CA-MRSA isolates is also increasing is unknown. We determined the SCCmec type in our MRSA blood isolates and stratified the results according to patient age and year of the study to compare time and age-related changes in the rate of MRSA SCCmec types II and IV.

Methods

Patients:

All MRSA blood isolates saved prospectively from adult (≥ 18 y) inpatients with *S. aureus* bacteremia from 2002-2012 were included.

Typing methods:

SCCmec types were determined by multiplex PCR targeting SCCmec types I, II, III, IVa, IVb, IVc, IVd, V and *mecA* gene (internal control). Positive and negative controls (four ATCC MRSA strains {BAA-39, BAA-41, BAA-42, BAA-44} and four previously typed MRSA patient strains {CA60-1, CA85, T-127 and T-162}) were included in each PCR assay.

Statistical methods:

Chi square and Extended Mantel-Haenszel chi square for linear trend tests were used to assess the significance of differences. All statistical tests were performed using the computer software SPSS release 20 and the interactive statistical calculations available at openepi.com. P value < 0.05 was considered to indicate statistical significance. The study was approved by the St. John Hospital Internal Review Board.

Results

- We encountered 1471 instances of *S. aureus* in blood cultures (BC) that corresponded to 1262 episodes of SAB among 1226 adult inpatients during the study periods. The first episode of bacteremia was selected for the study.
- 718 (58.6%) were caused by MRSA.
- SCCmec III/III and IV/IV accounted for 402 (56.0%) and 199 (27.7%) isolates, respectively.
- SCCmec IV/IV increased ($p < 0.0001$) and SCCmec III/III decreased ($p < 0.0001$) over time (Figure).
- These changes were significant changes in all age groups but were most apparent in patients ≥ 65 y (Table).

Figure: Trends in SCCmec III/III & IV/IV Prevalence in *S. aureus* Bacteremia

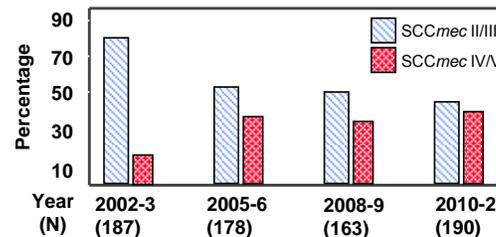


Table: MRSA Bacteremia SCCmec Types¹ Stratified by Age & Study Year

Age (y)	Study Year				p^2
	2002-3	2005-6	2008-9	2010-12	
18-30 (33)³					
SCCmec II and III	2/3 (66.7)	3/10 (30.0)	2/8 (25.0)	2/12 (16.7)	0.09
SCCmec IV and V	0	4 (40.0)	4 (50.0)	8 (66.7)	0.06
31-50 (146)					
SCCmec II and III	21/36 (58.3)	13/37 (35.1)	8/38 (21.0)	12/35 (34.3)	0.01
SCCmec IV and V	10 (27.8)	20 (54.1)	19 (50.0)	16 (45.7)	0.2
51-64 (218)					
SCCmec II and III	42/58 (72.4)	30/58 (51.7)	19/43 (44.2)	26/59 (44.1)	0.002
SCCmec IV and V	8 (13.8)	18 (31.0)	13 (30.2)	24 (40.7)	0.002
≥ 65 (321)					
SCCmec II and III	80/90(88.9)	45/73 (61.6)	50/74 (67.6)	47/84 (56.0)	0.00003
SCCmec IV and V	4 (4.4)	17 (23.3)	15 (20.3)	21 (25.0)	0.00003

1: All values are presented as number (%); 2: Extended Mantel-Haenszel Chi square for linear trends; 3: N of MRSA isolates

Conclusions

- CA-MRSA SCCmec types continue to increase in SAB.
- This increase is most apparent in the elderly.
- This may be due to CA-MRSA introduction and spread in the healthcare settings and persistence in the community.
- Eventually, HCA-MRSA may be replaced by CA-MRSA.

Limitations

- Single center study.
- Additional studies needed to determine if these findings are unique to our patients or represent a national trend.