Genetically typed community-acquired methicillin-resistant *Staphylococcus aureus* in a Canadian hospital

To the Editor:

Methicillin-resistant *Staphylococcus aureus* (MRSA) is an important cause of morbidity and mortality in hospital populations (1). The number of MRSA infections that are community-acquired (CA) is increasing in North America, and occurring with greater frequency among individuals who lack the risk profile associated with hospital-acquired (HA) MRSA (2,3). Using pulsed-field gel electrophoresis (PFGE), the National Microbiology Laboratory has identified four strains of *S aureus* that are responsible for most Canadian CA-MRSA infections: CMRSA10 (USA300), CMRSA7 (USA400), European CA-MRSA and USA1100 (4).

METHODS

A retrospective analysis was conducted of CA-MRSA cases identified using PFGE during a 30-month period at a tertiary teaching hospital in London, Ontario. During this time, all MRSA isolates from patients not known to be previously colonized with HA-MRSA were analyzed with PFGE. Any isolate with a PFGE pattern matching any one of the four National Microbiology Laboratory CA-MRSA strains was considered to be a case. Strain type determined entry into the present study; diagnosis in the community or within 48 h of admission were not inclusion criteria. A case was included in the analysis if the isolate was from a body site that explained the clinical symptoms. Patients with only nasal and/or rectal colonization or CA-MRSA grown in culture with multiple other potential pathogens were excluded from the analysis (n=4). Information on patient characteristics and exposure to risk factors in the past year was abstracted from medical charts.

RESULTS

Between January 2005 and June 2007, 48 patients with CA-MRSA infection were identified. Of 44 eligible patients, 18 (41%) were female and the majority were younger than 60 years of age (84%). Invasive infections were observed in 14% of cases, all adults. Nearly all cases had one risk factor (98%), such as a chronic medical condition (55%), antibiotic use (52%), hospitalization or health care contact (48%), history of skin problems (41%), exposure to a CA-MRSA-positive person (41%), exposure to the penal system (25%), travel to the USA (14%) or cosmetic body shaving (7%). The most common comorbidities were intravenous drug use (20%), hepatitis C infection (16%), chronic disease (16%) and psychological disorders (16%). Hospitalization or health care contact in the past year was significantly more likely to occur among adults than youth younger than 18 years of age, and among those with a chronic medical condition. However, without a control group, it was not possible to discern which factors were true risk factors for CA-MRSA.

The majority of cases presented with skin and soft tissue lesions (n=39; 89%); 38 of these had isolates from skin and soft tissue sites, and one had a culture-negative necrotic ulcer, but later presented with CA-MRSA bacteremia. Four cases presented with fever and no skin lesions, and were bacteremic. One case presented with neurological symptoms and CA-MRSA was isolated from the cerebrospinal fluid. Neither clinical presentation nor clinical syndromes differed between adult and pediatric cases; however, all six (14%) invasive infections occurred among adult cases. In addition to an isolate from the clinically relevant site, five (11%) cases were also colonized with CA-MRSA on nasal or rectal swabs.

DISCUSSION

The predominance of invasive disease among adults in the present study may reflect differences in health status and risk behaviours of adults versus children. Research suggests patients with invasive infections are more likely to be intravenous drug users and smokers with more comorbidities (5). As well, the potential for treatment delay among marginalized adults may contribute to the development of invasive infections in this group. Because our sample was from a tertiary care centre, the number of clinically advanced infections may be over represented compared with a community-based sample.

Most patients (89%) had isolates belonging to the CMRSA10 (USA300) strain, 9% were CMRSA7 (USA400), and only one was identified as the European CA-MRSA strain. All isolates showed susceptibility to trimethoprim-sulfamethoxazole, vancomycin and gentamicin. Clindamycin resistance was seen in 18% of isolates, all of which were constitutively resistant. Erythromycin resistance was seen in 89% of isolates. Whereas pediatric cases were more likely to receive therapy tailored toward CA-MRSA (100% versus 60%, respectively; $P<0.005$), adult cases were more likely to receive antibiotics inactive against MRSA, even after culture and sensitivity results were known, although five of the six bacteremic cases were treated with an antibiotic active against CA-MRSA. While this may reflect a cautious approach to the treatment of pediatric infections, there is now evidence to support the use of minimal to no treatment in minor skin and soft tissue infections, even in the pediatric population (6).

Whereas this study identified CA-MRSA cases by genetic typing, other studies have used an epidemiological case definition (7), which excludes patients with recent hospitalization. Use of the latter definition in our study would have excluded nearly one-half of the cases. While these cases had genetically typed CA-MRSA strains, we do not know whether infection was acquired in the community or hospital. We noted that cases with a history of hospitalization or health care contact in the past year were more likely to have a chronic medical condition. Such cases may act as a conduit for MRSA transmission between community and hospital populations. A study in Atlanta (8) observed that nearly 30% of health care-associated blood stream infections from MRSA were due to CMRSA10 (USA300), which has been classified as a community-acquired strain (8). These findings suggest that it will be increasingly difficult to make a clear distinction between CA-MRSA and HA-MRSA cases, which may also affect clinical and infection control.

CONCLUSIONS

Although some studies suggest that CA-MRSA infections are occurring with greater frequency among individuals with no predisposing risk factors (2), nearly all CA-MRSA cases in our study had at least one documented risk factor. Results from the present study and others suggest that clinicians should inquire about the risk factors such as travel to the United States, exposure to the persons in contact with the penal system, participation in team or contact sports (9), and sexual history (10). Health care professionals should include CA-MRSA in the differential diagnosis of skin and soft tissue infections, especially if a risk factor is present.

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REFERENCES

1. Cosgrove SE, Sakoulas G, Perencevich EN, Schwaber MJ, Karchmer AW, Carmeli Y. Comparison of mortality associated with methicillin-resistant and methicillin-susceptible *Staphylococcus aureus* bacteremia: A meta-analysis. Clin Infect Dis 2003;36:53-9.
2. Herold BC, Immergluck LC, Maranan MC, et al. Community-acquired methicillin-resistant *Staphylococcus aureus* in children with no identified predisposing risk. JAMA 1998;279:593-8.
3. Carleton HA, Diep BA, Charlebois ED, Sensabaugh GF, Perdreau-Remington F. Community-adapted methicillin-resistant *Staphylococcus aureus* (MRSA): Population dynamics of an expanding community reservoir of MRSA. J Infect Dis 2004;190:1730-8.
4. Public Health Agency of Canada. Methicillin-Resistant *Staphylococcus aureus* (MRSA). <www.nml-lnm.gc.ca/eb-be/ARNI-RAIN-MRSA-eng.htm> (Version current at January 15, 2008).
5. Buck JM, Como-Sabetti K, Harriman KH, et al. Community-associated methicillin-resistant *Staphylococcus aureus*, Minnesota, 2000-2003. Emerg Infect Dis 2005;11:1532-8.
6. Lee MC, Rios A, Aten MF, et al. Management and outcome of children with skin and soft tissue abscesses caused by community-acquired methicillin-resistant *Staphylococcus aureus*. Pediatr Infect Dis J 2004;23:123.
7. Naimi TS, LeDell KH, Como-Sabetti K, et al. Comparison of community- and health care-associated methicillin-resistant *Staphylococcus aureus* infection. JAMA 2003;290:2976-84.
8. Seybold U, Kourbatova EV, Johnson JG, et al. Emergence of community-associated methicillin-resistant *Staphylococcus aureus* USA 300 genotype as a major cause of health care-associated blood stream infections. Clin Infect Dis 2006;42:647-56.
9. Begier EM, Frenette K, Barrett NL, et al. A high-morbidity outbreak of methicillin-resistant *Staphylococcus aureus* among players on a college football team, facilitated by cosmetic body shaving and turf burns. Clin Infect Dis 2004;39:1446-53.
10. Cook HA, Furuya EY, Larson E, Vasquez G, Lowy FD. Heterosexual transmission of community-associated methicillin-resistant *Staphylococcus aureus*. Clin Infect Dis 2007;44:410-3.