Community-associated methicillin-resistant *Staphylococcus aureus* infections in men who have sex with men: A case series

R Sztramko BHSc[1], K Katz MD[1,2], T Antoniou PharmD[3], MR Mulvey PhD[4], J Brunetta MD[5], F Crouzat MD[5], C Kovacs MD[1,5], B Merkley MD[5], D Tilley MD[5], Mona R Loutfy MD MPH[1,2,5]

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BACKGROUND: The purpose of the present study was to describe the clinical characteristics and management of community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) infections among a cohort of men who have sex with men.

PATIENTS AND METHODS: A retrospective chart review was conducted of patients with culture-proven MRSA at Maple Leaf Medical Clinic (Toronto, Ontario) between November 2004 and December 2005. Cases were identified by individual physicians and by queries in the clinical management system. A standard data collection form was used to record patient demographics, potential risk factors for MRSA and course of illness. When available, antimicrobial sensitivities were recorded. DNA fingerprinting using pulsed-field gel electrophoresis, and genetic analysis for SCC*mec* typing and detection of the Panton-Valentine leukocidin cytotoxin were performed on six available isolates.

RESULTS: Seventeen patients with MRSA infection were identified, 12 (71%) of whom were HIV-positive. The most common clinical presentation was abscess (35%), followed by furuncle (17%), folliculitis (17%), cellulitis (17%) and sinusitis (12%). The majority of MRSA isolates were resistant to ciprofloxacin (92%) and levofloxacin (77%). All isolates were susceptible to trimethoprim-sulfamethoxazole, rifampin, linezolid, gentamicin and clindamycin, while the majority were susceptible to tetracycline (80%). All six isolates tested were SCC*mec* type IVa-positive and Panton-Valentine leukocidin-positive, and had fingerprint patterns consistent with the CMRSA-10 (USA300) clone.

CONCLUSION: The present study describes the clinical presentation and management of CA-MRSA infections occurring in Toronto among men who have sex with men. The infections appear to have been caused by CMRSA-10, which has caused the majority of CA-MRSA outbreaks elsewhere.

Key Words: *Canada; Community-associated methicillin-resistant* Staphylococcus aureus*; Men who have sex with men*

Infections à *Staphylococcus aureus* résistant à la méthicilline, acquises dans la communauté, chez des hommes ayant des relations sexuelles avec d'autres hommes : série de cas

CONTEXTE : L'étude avait pour but de décrire les caractéristiques cliniques et la prise en charge des infections à *Staphylococcus aureus* résistant à la méthicilline (SARM), acquises dans la communauté, dans une cohorte d'hommes ayant des relations sexuelles avec d'autres hommes.

PATIENTS ET MÉTHODE : Nous avons entrepris un examen rétrospectif de dossiers de patients, porteurs avérés d'infections communautaires à SARM, à la Maple Leaf Medical Clinic, à Toronto, entre novembre 2004 et décembre 2005. Les cas ont été repérés par des médecins et par des demandes de recherche dans le système de gestion des données cliniques. Nous avons utilisé un formulaire uniforme de collecte de données pour noter les renseignements démographiques, les facteurs de risque possibles d'infection à SARM et l'évolution de la maladie. Les résultats des épreuves de sensibilité aux antimicrobiens ont également été notés, le cas échéant. Enfin, une empreinte génétique de l'ADN par électrophorèse en champ pulsé, une analyse génétique en vue du typage par SCC*mec* et la détection de la leucocidine de Panton-Valentine, une cytotoxine, ont été effectuées sur six isolats.

RÉSULTATS : Dix-sept patients atteints d'infections à SARM ont été repérés, dont 12 (71 %) étaient positifs à l'égard du VIH. La manifestation clinique la plus fréquente était l'abcès (35 %), suivi du furoncle (17 %), de la folliculite (17 %), de la cellulite (17 %) et de la sinusite (12 %). La plupart des isolats de SARM étaient résistants à la ciprofoxacine (92 %) et à la lévofloxacine (77 %); tous les isolats étaient sensibles au triméthoprime-sulfaméthoxazole, à la rifampicine, au linézolide, à la gentamycine et à la clindamycine, et bon nombre étaient sensibles à la tétracycline (80 %). Les six isolats se sont révélés de type IVa à l'épreuve SCC*mec* et positifs à l'égard de la leucocidine de Panton-Valentine, et leur empreinte génétique concordait avec celle du clone CMRSA-10 (USA300).

CONCLUSION : La présente étude a fait état des manifestations cliniques et de la prise en charge des infections communautaires à SARM, à Toronto, chez des hommes ayant des relations sexuelles avec d'autres hommes. Les infections semblent avoir été causées par la souche CMRSA-10, à l'origine de la plupart des éclosions de ce type d'infections, enregistrées ailleurs.

Methicillin-resistant *Staphylococcus aureus* (MRSA) has been a significant bacterial pathogen in hospitals and long-term care settings for over four decades (1). Risk factors for colonization and infection with health care-associated MRSA have been well described, and include prolonged hospitalization, dialysis and presence of indwelling catheters (2-5). However, in recent years, several outbreaks of MRSA infection in the United States and Europe have been described in otherwise healthy individuals who lack traditional risk factors for MRSA acquisition. Specifically, outbreaks of community-associated MRSA (CA-MRSA) have occurred in daycare centres, where children come in close physical contact with each other; participants of sports teams; military personnel and men who have sex with men (MSM) (6-10). Although

[1]*Faculty of Medicine, University of Toronto;* [2]*Division of Infectious Diseases, North York General Hospital;* [3]*Department of Family and Community Medicine, St Michael's Hospital, Toronto, Ontario;* [4]*National Microbiology Laboratory, Winnipeg, Manitoba;* [5]*Maple Leaf Medical Clinic, Toronto, Ontario*

Correspondence: Dr Mona Loutfy, Maple Leaf Medical Clinic, 70 Carlton Street, Toronto, Ontario M5B 1L6. Telephone 416-465-0856 ext 1, fax 416-465-0792, e-mail Mona.Loutfy@wchospital.ca

TABLE 1
Patient demographics and clinical characteristics

Characteristic	Total (n=17)
Mean age, median years (range)	38 (24–50)
Ethnicity, n (%)	
Caucasian	13 (76)
Black	1 (5.9)
Asian	0 (0)
First Nations	0 (0)
Hispanic	3 (17.6)
Other	0 (0)
Risk factors, n (%)	
Hospitalization (previous year)	1 (5.9)
Antibiotic exposure (previous six months)	6 (35.3)
Surgery (previous year)	2 (5.9)
Household contact	1 (5.9)
Indwelling catheter	0 (0)
Dialysis	0 (0)
Diabetes	1 (5.9)
Prednisone use	0 (0)
HIV information	
HIV-positive, n (%)	12 (71)
CD4+ count (most recent before infection), cells/mm^3, median (range)	520 (290–1084)
Viral load (most recent before infection), copies/mL, median (range)	9233 (<50–145,565)
TMP-SMX prophylaxis, n (%)	0 (0)
Antiretroviral therapy (n=12), n (%)	6 (50)
Clinical presentation, n (%)	
Abscess	6 (35.3)
Furuncle	3 (17.6)
Folliculitis	3 (17.6)
Cellulitis	3 (17.6)
Sinusitis	2 (11.8)
MRSA-related treatment, n (%)	
TMP-SMX monotherapy	6 (35.3)
TMP-SMX and rifampin	7 (41.2)
TMP-SMX and doxycycline	2 (11.8)
Rifampin and doxycycline	2 (11.8)
Mupirocin to nares	10 (58.8)
Mupirocin to wound	3 (23.5)
Chlorhexidine washes	6 (35.3)

TMP-SMX Trimethoprim-sulfamethoxazole

outbreaks of CA-MRSA have been reported in Canada in a correctional facility and in a First Nations community, descriptions of CA-MRSA infections in a cohort of Canadian MSM are lacking (11-13). The purpose of the present study was to characterize CA-MRSA infections among MSM that were identified at Maple Leaf Medical Clinic in downtown Toronto, Ontario.

PATIENTS AND METHODS

Study population and study design

A retrospective chart review was performed of all patients with MRSA infection at Maple Leaf Medical Clinic in downtown Toronto between November 2004 and December 2005. The clinic serves a culturally diverse, inner-city population of approximately 12,000 patients, 2500 of whom are infected with HIV. Approximately 95% of HIV-positive patients seen at the clinic are men, the majority of whom are MSM. Patients were identified for MRSA and MRSA-related topics by clinic physicians and by queries in the electronic clinical management system. All patients at the clinic identified as MSM with a clinical manifestation of CA-MRSA and confirmatory microbiological testing were included in the study.

Data collection

Ethics approval was obtained for the publication of the findings. A standard data collection form was created and used for all patients. Charts of eligible patients were reviewed for the extraction of demographic data, risk factors, HIV-related information, initial and follow-up treatment, and clinical course. Demographics included date of birth, sex, ethnicity, MSM status and postal code. The HIV-related information collected included serostatus, CD4 count and viral load results just before CA-MRSA infection, use of trimethoprim-sulfamethoxazole (TMP-SMX) prophylaxis and use of antiretroviral treatment. The clinical characteristics of the infections were extracted including the location, number and size of lesions, the use of incision and drainage, initial and definitive treatments, and whether patients experienced recurrences of infections after they had received treatment. Recurrences were determined by clinical diagnosis and cultures when available.

Laboratory identification and testing of MRSA isolates

MRSA was cultured from wound swabs using standard microbiological methods at various Canadian Medical Laboratories. Bio-Rad MRSA*Select* (Bio-Rad Laboratories, USA) was used as the MRSA screen plates and pink colonies were confirmed as MRSA with a genprobe *mec*A screen. Antibiograms were collected on all identified strains using BD Phoenix AP (BD Diagnostics, USA) for susceptibilities. Six isolates were retrieved for further testing and were sent to the National Microbiology Laboratory in Winnipeg, Manitoba, for molecular characterization. DNA fingerprinting by pulsed-field gel electrophoresis was performed on these isolates to identify the molecular subtype of MRSA responsible for the outbreak (14). Isolates were also analyzed for the presence of the Panton-Valentine leukocidin (PVL) gene using polymerase chain reaction, and SCC*mec* typing was determined (15,16).

Statistical analysis

Data for all patients were entered into a Microsoft Access database (Microsoft Corporation, USA). Patient demographics, risk factors, clinical course and microbiological variables were summarized using medians and ranges for continuous variables and proportions for categorical variables. All statistical analyses were performed using SAS version 9.1 statistical software (SAS Institute, USA).

RESULTS

Patient characteristics

Seventeen patients with MRSA infection were identified between November 2004 and December 2005. Patient demographics and individual cases are summarized in Tables 1 and 2, respectively. The median age of subjects was 38 years (range 24 to 50 years). Seventy-six per cent of patients were Caucasian, 5.9% were black and 17.6% were Hispanic. Twelve (71%) of the patients were HIV-positive. Only one patient had

TABLE 2
Case summaries

Patient number	HIV status	Date of presentation	Clinical presentation	Empirical treatment	Definitive treatment	Potential risk factors for CA-MRSA	Recurrence
1	Positive	November 11, 2004	Abscess (chest)	Oral cephalexin	TMP-SMX	Health care worker, antibiotic use within preceding six months (cefixime and doxycycline)	No
2	Negative	December 12, 2004	Furuncles (n=3) (right cheek and occiput)	Oral cephalexin	TMP-SMX	Intimate contact with person with similar symptoms	No
3	Positive	February 1, 2005	Sinusitis	Rifampin + doxycycline, mupirocin to nares	Rifampin + doxycycline Mupirocin to nares	None identified	No
4	Positive	April 27, 2005	Furuncle (buttocks)	Oral cloxacillin	TMP-SMX + doxycycline	Antibiotic use in preceding six months (cloxacillin and amoxicillin), frequents bathhouses	Yes
5	Positive	June 8, 2005	Sinusitis	Fucidin to nares, TMP-SMX + rifampin	TMP-SMX + rifampin mupirocin to nares	None	No
6	Negative	June 23, 2005	Cellulitis (pubic region)	Oral cephalexin + topical terbinafine	TMP-SMX	None	No
7	Positive	August 10, 2005	Abscess (rectum)	TMP-SMX + rifampin mupirocin to nares, chlorhexidine wash	TMP-SMX + rifampin mupirocin to nares, chlorhexidine wash	Antibiotic use in preceding six months (azithromycin), surgery in past year	No
8	Positive	August 23, 2005	Cellulitis (right axilla)	TMP-SMX + rifampin	TMP-SMX + rifampin mupirocin to nares, chlorhexidine wash	Antibiotic use in preceding six months (cephalexin)	No
9	Negative	September 28, 2005	Folliculitis (scrotum)	Oral cephalexin + topical fusidic acid	TMP-SMX + rifampin mupirocin to nares, chlorhexidine wash	Antibiotic use within preceding six months (ciprofloxacin and azithromycin), frequents bathhouses	No
10	Positive	October 4, 2005	Abscess (upper left chest)	Oral cephalexin	TMP-SMX, mupirocin to nares, chlorhexidine wash	None	No
11	Positive	October 5, 2005	Folliculitis (right groin)	TMP-SMX + topical fusidic acid	TMP-SMX	None	No
12	Positive	October 18, 2005	Cellulitis (posterior thigh on right upper leg)	Oral cephalexin	TMP-SMX + rifampin mupirocin to nares, chlorhexidine wash	None	No
13	Positive	October 22, 2005	Abscess (lower abdomen)	Oral cephalexin	TMP-SMX + rifampin, mupirocin to nares, wound	Registered nurse Antibiotic use within preceding six months (TMP-SMX)	No
14	Positive	October 31, 2005	Abscess (abdomen)	TMP-SMX + doxycycline, mupirocin to nares, wound, chlorhexidine wash	TMP-SMX + doxycycline, mupirocin to nares, wound, chlorhexidine wash	Surgery in preceding year	No
15	Negative	November 2, 2005	Folliculitis (right cheek)	TMP-SMX (allergy)	Doxycycline + rifampin	None	Yes
16	Positive	November 7, 2005	1 cm abscess (right side of neck)	Oral cephalexin + topical fucidic acid	TMP-SMX + rifampin, mupirocin to nares, wound	None	No
17	Negative	November 8, 2005	Ulcerated furuncle (right upper buttocks)	TMP-SMX	TMP-SMX	None	No

CA-MRSA Community-associated methicillin-resistant Staphylococcus aureus*; TMP-SMX Trimethoprim-sulfamethoxazole*

been hospitalized in the previous year, two had undergone surgeries (one unknown and one tympanostomy procedure), and six had received antibiotic treatment in the six months before being diagnosed with CA-MRSA. No patients had an indwelling catheter, received dialysis or were taking prednisone. Social risk factors were more difficult to ascertain from the medical chart.

In the 12 patients who were HIV-positive, the median viral load and CD4+ counts were 9233 copies/mL (range less than 50 copies/mL to 145,565 copies/mL) and 520 cells/mm^3 (range 290 cells/mm^3 to 1084 cells/mm^3), respectively. Six patients were taking antiretroviral treatment. No patients were receiving TMP-SMX as prophylaxis for opportunistic infections.

Clinical course and treatment

The most common clinical presentation of CA-MRSA in this cohort was abscess (35.3%), followed by furuncles (17.6%), folliculitis (17.6%), cellulitis (17.6%) and sinusitis (11.8%) (Table 1). The most commonly affected site was the buttocks and genital region (29%), followed by chest and axilla, and face and neck regions. The abscesses ranged in size from 1 cm to 5 cm. None of the patients had signs of systemic illness. Potential risk factors for CA-MRSA infection could not be determined in the majority of cases (Table 2).

Patients presenting with an abscess were treated with incision and drainage, followed by a course of systemic oral antibiotics (n=6). The remaining patients received systemic antibiotic therapy alone. Empirical therapy with beta-lactam antibiotics was initiated in nine patients and was subsequently modified based on the results of the culture and sensitivities. The remaining eight patients received empirical therapy directed against MRSA. Antibacterial regimens included monotherapy with TMP-SMX, and combinations of TMP-SMX and rifampin, TMP-SMX and doxycycline and doxycycline and rifampin (Table 1). The median duration of antibiotic therapy was 10 days (range 10 to 30 days). No patient received therapy with intravenous antibiotics. Commonly used adjuvant therapies included mupirocin to the nares or to the wound site and chlorhexidine washes. Recurrent infections with CA-MRSA were observed in two patients. Both patients initially presented with furuncles and had recurrences within one month of the initial resolution date. The recurrences occurred in the same location as the initial presentation. One recurrence was culture-proven and the other was based on clinical judgment.

Bacterial characteristics

Culture and sensitivity testing demonstrated resistance to all beta-lactam antibiotics and erythromycin; the majority of isolates were resistant to ciprofloxacin (92%) and levofloxacin (77%). In all cases, the cultured isolates were 100% susceptible to TMP-SMX, rifampin, linezolid, gentamicin, clindamycin and nitrofurantoin, while the majority were susceptible to tetracycline (80%). Of the six isolates that were retrieved for further genetic analysis, all were found to carry the SCC*mec* type IVa gene and the gene that encodes for PVL exotoxin. The six isolates were also identified as the CMRSA-10 (USA300) clone based on fingerprint pattern.

DISCUSSION

CA-MRSA is becoming an increasingly prevalent pathogen, accounting for approximately 8% to 20% of all MRSA isolates in Canada and the United States (17,18). In the present report, we summarize the characteristics of CA-MRSA in a cohort of MSM from a Canadian centre occurring over a 13-month period. All 15 patients who presented with skin and soft tissue infections were amenable to treatment by incision and drainage, and oral antibiotics or oral antibiotics alone. Two patients presented with sinusitis that was treated with antibiotics alone. DNA fingerprinting using pulsed-field gel electrophoresis revealed that the outbreak strain was CMRSA-10, which is equivalent to the USA300 clone responsible for the majority of the community outbreaks in the United States. Genetic testing of six isolates confirmed the presence of genes that encode for the PVL cytotoxin and SCC*mec*IV cassette.

Our report adds to the existing literature describing the clinical manifestations of CA-MRSA infection in MSM. In a case-control study (19) of 35 HIV-positive MSM with skin infections attributable to CA-MRSA, most patients presented clinically with either an abscess (55.2%) or cellulitis (31.0%). As with our study, infections were associated with the USA300 clone (CMRSA-10) of CA-MRSA. Risk factors for CA-MRSA infection in the aforementioned study were associated with high-risk sex and drug-using behaviours, but not with immune status. In contrast, a separate study of HIV-infected adults with clinically significant health care-associated MRSA infections identified a CD4+ cell count of less than 50 cells/mm^3, higher plasma viral load and absence of TMP-SMX prophylaxis for opportunistic infections as significant risk factors for MRSA infection (20). In our study, patients with HIV infection did not have advanced disease, as evidenced by the high median CD4+ cell counts before infection. Receipt of an antibiotic within the six months preceding infection was identified as the most common potential risk factor for infection in our cohort. More research is clearly necessary to better ascertain risk factors for CA-MRSA acquisition among this Canadian patient population.

Presently, there are few data describing the optimal treatment of CA-MRSA infections. Recently published guidelines regarding the management and prevention of infections caused by CA-MRSA recommend incision and drainage without antimicrobial therapy in mild cases of skin and soft tissue disease attributable to this organism, with systemic antimicrobial therapy reserved for moderate or severe infections or infections observed in young or immunocompromised hosts (21). Routine decolonization is not recommended as part of the management of CA-MRSA infection, but can be considered in cases of recurrent disease or during the management of outbreaks in selected closed settings (21).

SUMMARY

We describe the clinical characteristics and management of CA-MRSA-related infections in a cohort of MSM. Our findings are limited by the small sample size of our report, and the inability to identify the source of infection or risk factors for infection in the majority of cases. Nevertheless, our experience and that of others reinforces the need to heighten awareness about the emerging role played by CA-MRSA as a pathogenic agent in the outpatient setting. Patient and provider education directed at reinforcing basic hygiene practices and judicious antibiotic use will be essential in curtailing the further spread of CA-MRSA.

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