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Case report

A Case of Community-Associated Methicillin-Resistant *Staphylococcus Aureus* Infections in a Community Hospital

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Abstract

Infections caused by methicillin-resistant *Staphylococcus Aureus* (MRSA) have recently occurred in communities in people lacking known healthcare risk factors. This MRSA infection is referred to as community-associated MRSA (CA-MRSA) infection, and is distinct from hospital-associated MRSA infection, which occurs in people with risk factors. We experienced a patient diagnosed with CA-MRSA cellulitis, as culture of pus revealed MRSA and he had not been exposed to healthcare environments for the past year. The patient was a previously healthy 38-year-old man with suppurative cellulitis in his right index finger following injury to the finger at his worksite. The cellulitis was successfully managed with incision and drainage (I&D), followed by cefazolin during a 10-day clinical course, although the patient's MRSA strain was resistant to cefazolin. There are several reports that suggest that I&D followed by antibiotic treatment for CA-MRSA skin infection produces equivalent clinical outcomes, whether the antibiotic prescribed was effective or not. Given that MRSA emerged in an outpatient setting, CA-MRSA should be considered a possible etiology of skin infection in healthy individuals with no classical risk factors for acquisition of MRSA.

Key words: community-associated methicillin-resistant *Staphylococcus Aureus* (CA-MRSA), skin and soft tissue infection, antibiotic treatment, incidence, colonization

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Introduction

Although long considered a typical nosocomial pathogen, methicillin-resistant *Staphylococcus Aureus* (MRSA) has recently emerged as a cause of infections in communities. Currently, two main categories are recognized: hospital-associated (HA-MRSA) and community-associated MRSA (CA-MRSA). Infections caused by CA-MRSA begin in communities in people lacking known HA-MRSA risk factors, including recent hospital contact, surgery, residence in a long-term care facility, dialysis or the presence of invasive medical devices[1)]. CA-MRSA causes skin and soft-tissue infection (SSTI), which accounts for more than half of all SSTI-related *S. aureus* isolates in an outpatient setting in the United States[1, 2)]. While severe and life-threatening infections such as necrotizing pneumonia[3)], necrotizing fasciitis[4)] and severe sepsis[5)] represent rare cases, these life-threatening infections can become virulent strains with the presence of Panton-Valentine leukocidin (PVL) toxin[6)].

In Japan, the epidemiology of CA-MRSA has not been fully described. Hisata surveyed 818 healthy children's nasal cavities and found MRSA among 35 children (4.3%). Two thirds of these 35 were categorized as CA-MRSA by genetic characteristics[7)]. Cases of PVL positive CA-MRSA are very rare[8)]. In the past, SSTI was infected with either methicillin-sensitive *Staphylococcus Aureus* (MSSA) or *Streptococcus pyogen*. Currently, clinicians have to consider CA-MRSA as a causative organism and should become familiar with treatment for this infection. We report a case of CA-MRSA cellulitis in a remote community.

CA-MRSA Case Characteristics and Clinical Course

The patient is a previously healthy 38-year-old male mechanic with a lacerated wound to his right index finger. The finger was injured one hour earlier, when heavy machinery accidentally fell at his workplace. The man had been wearing gloves, and the wound was clean. He stated he was not currently taking any medication and had not recently

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been to a hospital. Examination of the patient revealed normal findingsexcept for the proximal region of his right index finger, which revealed a laceration 15 mm long, with slight swelling of the area. An X-ray of the right index finger confirmed a fracture line of the proximal phalanx without any deep tissue pathology. After debridement with saline, the wound was sutured. He was referred to outpatients without any antibiotics. The wound was dressed on the third and seventh days, with no sign of infection or swelling.

However, ten days after the injury, the sutured wound showed marked swelling and redness, so the patient was admitted with a diagnosis of suppurative cellulitis of the right index finger. Physical examination of the patient revealed a temperature of 38.2ºC, blood pressure of 154/84 mmHg and a pulse rate of 110 beats/min. The right index finger and dorsum of the right hand were warm, swollen and erythematous. The rest of the examination revealed normal findings. Routine laboratory findings on admission disclosed normal values, except for a white blood cell count of 16,800, with 83.3% neutrophils and 3.68 C-reactive protein. After the sutures were cut, the wound discharged pus. The wound was debrided with saline, and then 2 g of cefazolin was administered intravenously twice a day for 10 days. The wound gradually healed. However, the results of culture of the pus from the day of admission were received on day 10 and revealed 10 to 20 colonies of gram-positive cocci. The cocci proved to be MRSA, susceptible to vancomycin and chloramphenicol, intermediately resistant to minocycline and fosfomycin and resistant to ampicillin-sulbactam, amoxicillin, cefazolin, gentamicin, clindamycin, erythromycin, imipenem, trimethoprim-sulfamethoxazole and levofloxacin. The patient was given 0.5 g of vancomycin intravenously for an additional four days after the tenth day of hospitalization. The patient was discharged without medication on day 14.

Discussion

Many investigators have identified isolates that cause CA-MRSA infection by using the epidemiological definition based on the patient's lack of healthcare risk factors in their medical history, a definition advocated by the Centers for Disease Control and Prevention (CDC) in 2000[9, 10]. As CA-MRSA strains vary in genetic and antimicrobial resistance profile, CA-MRSA is classified by the type of antimicrobial resistance profiles and genetic characteristics. The genetic profile was not evaluated in this case because it is not commercially available. In regard to antimicrobial resistance profiles, however, the patient's strain shows a multi-resistant pattern to microbes, suggesting a similarity with the pattern of HA-MRSA. CA-MRSA is generally more susceptible to antibiotics than HA-MRSA. While HA-MRSA tends to be multi-resistant, CA-MRSA is usually susceptible to narrow-spectrum non-β-lactams such as fluoroquinolones, clindamycin, trimethoprim-sulfamethoxazole (TMP-SMX) and tetracyclines[11]. The antimicrobial resistance finding of our patient's isolates —an HA-MRSA pattern— may be interpreted to imply that the culture was contaminated by HA-MRSA in the hospital. However, the culture yielded 10 to 20 colonies of gram-positive cocci identifying MRSA in this case, which is too many to suggest contamination of the culture. Another speculative interpretation is that there are two types of MRSA in communities. CA-MRSA strains are gradually becoming entrenched as nosocomial pathogens and vice versa[12–14]. Nevertheless, in this case, MRSA was isolated from an outpatient with no known exposure to the health care environment in a community hospital, and this serves as a warning to primary care physicians of the emergence of MRSA in outpatient settings.

The infection route of MRSA is speculated to be MRSA colonization of the patient, although no supporting data was obtained in this case. *S. aureus* colonization of the nares, hands and groin occurs in about 30% of healthy adults[14]. CA-MRSA colonizes about 3% of healthy individuals and is a risk factor for the development of a CA-MRSA SSTI[15]. Although elimination of *S. aureus* nasal colonization with intranasal mupirocin in a hospital setting can reduce nosocomial infection[16, 17], there are limited data showing that reducing CA-MRSA colonization decreases invasive disease. Investigators have previously shown that despite decreasing CA-MRSA colonization through eradication, the rates of SSTI are not affected[18]. This argues against the concept that colonization must precede infection. Therefore, although CA-MRSA has tropism for colonizing human skin, it is not clear that this colonization must precede infection[19]. It is more likely that CA-MRSA is acquired from shared fomites or close contact with colonized or infected individuals. This has led us to speculate that the family members of the patient discussed might constitute a route of infection in relation to compromised skin integrity (lacerations, abrasions and burns), which is a risk factor for CA-MRSA.

As the present patient demonstrated systemic toxicity, we treated him with antibiotics intravenously. Empiric antibiotic therapy might be considered for those who are immunocompromised or who present with a large surrounding area of cellulitis, systemic toxicity or lymphangitis[20]. The patient improved with administration of cefazolin, although the MRSA was resistant to cefazolin in the sensitivity study. One potential explanation for this result is that incision and drainage (I&D) without cefazolin had been effective. In the treatment of CA-MRSA skin infection, there is evidence suggesting that I&D is more important than

antibiotic susceptibility in immunocompetent patients. One piece of data shows that most patients receiving I&D followed by antibiotic treatment for CA-MRSA skin infection had equivalent clinical outcomes whether the antibiotic prescribed was effective or not[21]. In an immunocompetent pediatric population with I&D for abscesses smaller than 5 cm, children receiving no antibiotics or antibiotics to which the pathogen was resistant fared as well as those receiving effective antibiotics[22]. Moreover, in a large community prospective study of skin and soft-tissue infection, 57% of CA-MRSA infections were resistant to the empirically prescribed antibiotic. Fortunately, neither susceptibility nor resistance to antibiotics prescribed had any effect on patient outcomes[1]. Perhaps a large, rigorous, randomized controlled trial will be needed to show physicians whether antibiotics are effective or not.

In conclusion, the patient with suppurative cellulitis due to CA-MRSA was successfully treated with I&D followed by antibiotics. As MRSA has emerged in the outpatient setting, CA-MRSA should be considered a possible etiologic agent of SSTI in healthy individuals with no classical risk factors for acquisition of MRSA.

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