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Community-Associated Methicillin-Resistant *Staphylococcus aureus* Mediastinitis▽

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Community-associated methicillin (meticillin)-resistant *Staphylococcus aureus* (CA-MRSA) continues to emerge as a cause of serious infections, chiefly of the skin and soft tissues. We present the first documented case of CA-MRSA mediastinitis in an adult. Blood and mediastinal isolates were characterized as CA-MRSA by pulsed-field gel electrophoresis and susceptibility testing.

CASE REPORT

A 47-year-old female presented to the Emergency Department with progressive, severe chest pain and dyspnea. She had been evaluated for fever and a productive cough on an outpatient basis 3 days prior and was prescribed levofloxacin when a chest X-ray revealed multilobar infiltrates. She denied any recent hospitalization or surgeries and reported no sore throat, oral lesions, dental problems, dysphagia, odynophagia, nausea, or vomiting. Her pertinent medical history included hypertension, hyperlipidemia, fibromyalgia, and well-controlled systemic lupus erythematosus.

On examination, the patient was febrile to 102.4°F, hypotensive (blood pressure, 88/60 mmHg), tachycardic to 131 beats/min, tachypneic (respiratory rate of 40 breaths/min), and hypoxic (90% oxygen saturation on 4 liters/min oxygen by nasal cannula). Physical examination revealed normal conjunctivae, an absence of oral or dental lesions, no crepitus or induration of the neck, no evidence of cardiac murmurs or rubs, and decreased breath sounds on auscultation. A neurological examination was normal. Within a few hours, the patient displayed evidence of respiratory distress, which required intubation. Nasogastric tube placement following intubation resulted in some epistaxis. A repeat chest X-ray was unchanged from that performed on admission, revealing multilobar infiltrates without pleural effusion or focal abscess or a widened mediastinum. Hematological testing revealed a white cell count of 33,400/μl. Evidence of elevated cardiac biomarkers and ST segment elevations on electrocardiography prompted immediate cardiac catheterization, which did not reveal any evidence of thrombosis or infarction. Since the patient was febrile and relatively hypotensive with leukocytosis and evidence of multilobar pneumonia, broad-spectrum antibiotics were initiated for possible sepsis, including vancomycin at 1 g given intravenously every 12 h. Within 24 h of admission, multiple blood and sputum cultures were positive for methicillin (meticillin)-resistant *Staphylococcus aureus* (MRSA) and her antibiotic regimen was narrowed to vancomycin only. The initial vancomycin trough concentration was noted to be 12.4 μg/ml, and her vancomycin dose was increased to 1.5 g given intravenously every 12 h, resulting in a vancomycin trough concentration of 18.6 μg/ml on hospital day 4. Vancomycin trough concentrations were maintained between 14 and 22 μg/ml during her inpatient stay. A chest computed tomography (CT) was performed on hospital day 2, revealing a moderate pericardial effusion with no evidence of abscess. A transthoracic echocardiogram was performed on hospital day 2 and was negative for abscess or valvular vegetation. A transesophageal echocardiogram was attempted on hospital day 5 but was aborted due to the patient's gag reflex and inability to pass the scope. The patient defervesced, and her clinical status improved, allowing extubation on hospital day 6. Surveillance blood cultures on hospital days 4, 6, and 8 remained negative.

The patient continued to report substernal chest pain, orthopnea, and dyspnea, prompting a chest CT on hospital day 8. This study revealed multiple, large mediastinal and deep neck abscesses, the largest (mediastinal) of which measured 3.2 by 7.2 by 8 cm (Fig. 1). Ultrasound-guided drainage of the large mediastinal abscess with placement of an indwelling drain was performed, and culture of the recovered fluids was also positive for MRSA. Evaluation of the oral cavity and esophagus ruled out oral abscess and esophageal perforation, respectively, as potential sources of the abscesses. The neck and chest were reimaged on hospital day 17 with a contrasted CT, which showed a significant decrease in the size of the abscesses (Fig. 1). The patient's dyspnea and chest pain resolved, and the mediastinal drain was removed on hospital day 18. Thereafter, she made an uneventful recovery, completing a 4-week course of intravenous antibiotic therapy with vancomycin on an outpatient basis.

All of the bacteria recovered from blood, respiratory, and mediastinal fluid specimens were identified as MRSA by the clinical microbiology laboratory with the Vitek 2 (BioMérieux, Inc., Durham, NC). Eight of these MRSA isolates were further characterized by pulsed-field gel electrophoresis (PFGE) and resistance and virulence genotyping. All were found to be pulsed-field type (PFT) USA 300 by PFGE with SmaI restric-

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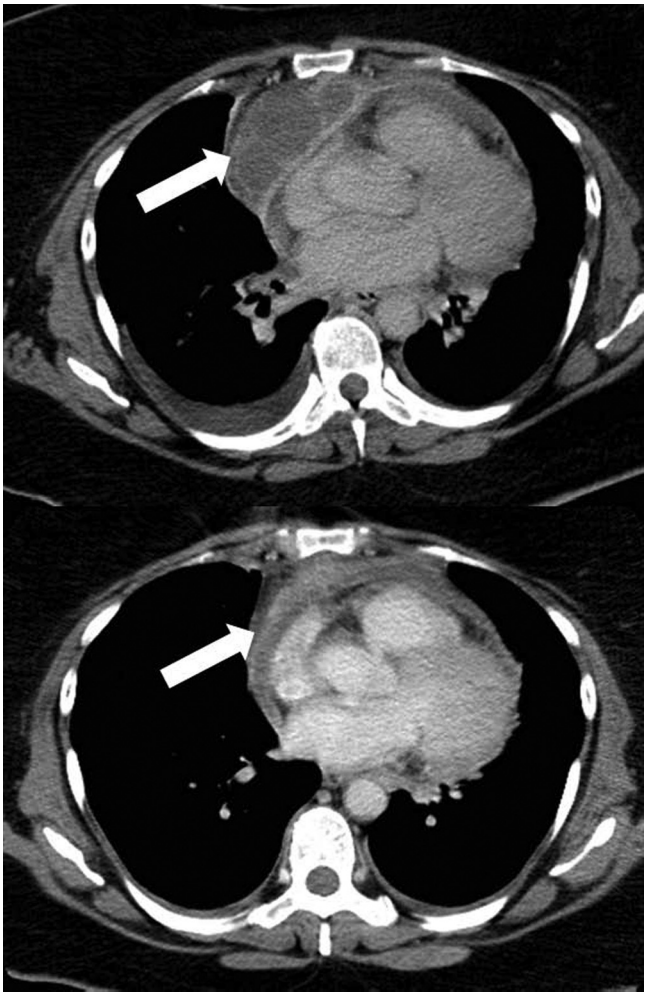

FIG. 1. CT scan of the chest of a patient with widespread mediastinal (arrows) and neck abscesses prior to (upper panel) and after (lower panel) percutaneous drainage. The largest of these measured 3.2 by 7.2 by 8 cm prior to drainage (arrow, upper panel).

tion enzyme digestion and a CHEF-DRIII system (Bio-Rad Laboratories, Hercules, CA) (5). PFGE patterns were interpreted and grouped into PFTs by using established criteria (5, 10). A multiplex PCR to simultaneously detect the staphylococcal cassette chromosome *mec* (SCC*mec*) genes was performed as described elsewhere (7). In addition, the isolates underwent PCR to detect the Panton-Valentine leukocidin (PVL) and arginine catabolic mobile element (ACME) genes (6). All isolates possessed SCC*mec* type IV, PVL, and ACME genes. All of the MRSA isolates (from blood, sputum, and mediastinal fluid) were susceptible to vancomycin, clindamycin, erythromycin, gentamicin, nitrofurantoin, and trimethoprim-sulfamethoxazole and resistant to oxacillin, penicillin, and ciprofloxacin as determined by Vitek 2. Vancomycin susceptibility (MIC, 1.5 μg/ml) was confirmed by Etest (BioMérieux, Inc., Durham, NC).

Discussion. While MRSA infections continue to increase in hospital settings, accounting for >60% of the isolates in U.S. intensive care units, community-acquired MRSA (CA-MRSA) strains are also emerging pathogens with considerable associated morbidity and mortality (1). Historically, risk factors for CA-MRSA infections have included injection drug use, prior antibiotic therapy, and recent hospitalization (4). Recent reports also identify young age, low socioeconomic status, and minority race or ethnicity as emerging risk factors (1, 4). Most CA-MRSA infections are associated with pyogenic skin and soft-tissue infections in previously healthy individuals (1). PVL toxin, in particular, is associated with community-associated soft tissue infections, as well as necrotizing pneumonia (4, 11). MRSA is occasionally associated with community-acquired pneumonia, typically occurring after influenza or viral upper respiratory infection and comprise 1 to 5% of community-acquired pneumonia cases, most being of SCC*mec* type IV (8).

The majority of CA-MRSA isolates in the United States carry the genes that encode PVL toxin and SCC*mec* type IV and are identified as PFT USA 300 (3). However, 28% of health care-associated infections and also 20% of nosocomial bloodstream infections have also been identified as PFT USA 300 (1, 3), suggesting its movement into the health care setting.

Our patient initially presented with pneumonia that went on to bacteremia and sepsis, requiring inpatient admission. She developed multiple neck and mediastinal CA-MRSA abscesses. Mediastinitis is a relatively uncommon infection involving the mediastinal structures and may result from a variety of underlying etiologies, including esophageal perforation, extension from head and neck infections, pneumonia, infected lymph nodes, or an infected sternotomy site. Organisms frequently implicated in infections stemming from the head and neck or esophageal perforation include anaerobes (e.g., *Peptostreptococcus*, *Actinomyces*, and *Fusobacterium* species), *Streptococcus* species, *Corynebacterium* species, and members of the family *Enterobacteriaceae*. *S. aureus* is more frequently associated with mediastinal infections secondary to cardiothoracic surgery (9). Mediastinitis due to MRSA, in particular, is uncommon, having previously been documented only in patients with a history of sternotomy and in children as a complication of retropharyngeal abscess (2, 12). Of note, reported cases of poststernotomy mediastinitis involve nosocomial rather than community-acquired organisms (2). Our patient did not have a history of cardiothoracic surgery, a pharyngeal abscess, or trauma to the pharynx or esophagus. Moreover, our patient had PFT USA 300 MRSA possessing PVL, ACME, and SCC*mec* type IV genes, consistent with the majority of the CA-MRSA strains found in the United States, in every isolate from respiratory, blood, and mediastinal abscess cultures. As our patient's vancomycin trough concentrations were consistently between 14 and 22 μg/ml, vancomycin treatment failure was unlikely. We theorize that the virulent nature of PVL-producing CA-MRSA significantly contributed to the development of her mediastinal abscesses.

Methicillin-resistant *S. aureus* mediastinitis is a particularly uncommon infection, and its known associations have previously been limited to complications of sternotomy in adults and retropharyngeal abscesses in children. However, our patient had neither a history of primary retropharyngeal infection nor a history of cardiothoracic surgery. We present a case of mediastinitis resulting from a complication of CA-MRSA pneumonia, a previously undocumented causality.

The views expressed herein are ours and do not reflect the official policy or position of the Department of the Air Force, the Department of the Army, the Department of Defense, or the U.S. Government.

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