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Arthritis caused by Methicillin-Resistant Staphylococcus aureus: A Case Report

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Abstract

Methicillin-resistant Staphylococcus aureus (MRSA) septic arthritis has emerged over the past 25 years as an increasingly prevalent and serious infection. We sought to characterize the clinical features of MRSA septic arthritis in adult patients. We report a case of community-acquired fatal MRSA septic arthritis of the hip and analyze the clinical features of 56 additional adult patients with native-joint MRSA septic arthritis identified through a systematic literature review. Among 56 previously reported cases of MRSA native-joint septic arthritis, 42 were men, 14 had polyarticular infections, 5 were previously healthy individuals with communityacquired infections, and 8 had a fatal outcome. The most frequent predisposing factor was a preexisting rheumatologic condition. The knees and shoulders were most commonly affected. MRSA native-joint septic arthritis is a predominantly male disease that is usually nosocomial in origin but can occur rarely in health care–naive patients. A preexisting rheumatic disease is the most common predisposition. Community-acquired MRSA septic arthritis can be fatal. Cultures should be performed promptly, to identify potential antibiotic resistance. Patients presenting with both community-acquired and nosocomial septic arthritis should receive initial antibiotic treatment that includes coverage for MRSA.

Keywords: Methicillin-resistant Staphylococcus aureus, Community-acquired methicillin- resistant Staphylococcus aureus, Infectious arthritis

Introductıon

Methicillin-resistant Staphylococcus aureus (MRSA) infections were for many years acquired primarily in the hospital setting and those acquired in the community were most often associated with intravenous drug abuse or prior hospitalization (1). MRSA septic arthritis was first reported in 1985 among intravenous drug abusers (2). However, community-acquired MRSA (CA-MRSA) infections are increasing in prevalence, often occur in patients without established risk factors, and predominantly involve the skin and soft tissue (2). Septic arthritis secondary to CA-MRSA has been reported in a limited number of pediatric and adult case series (3,4). We report the case of a patient who developed fatal sepsis in association with CA-MRSA hip arthritis. Our case demonstrates that CA-MRSA strains can be highly virulent and may cause fatal infections in immunocompetent patients without nosocomial exposures. A review of the literature was conducted to document the clinical features of MRSA septic arthritis in adult patients.

Case Report

A 55-year-old man, an actively employed maintenance engineer, presented to our hospital with a 3-day history of fever, progressive right hip pain without antecedent trauma, and difficulty ambulating. He had a poor appetite and extreme fatigue. On the day of presentation, he developed labored and rapid breathing. He had a history of untreated chronic hepatitis C infection, gouty arthritis, and knee osteoarthritis. The latter was treated with arthroscopic knee surgery 20 months earlier and subsequent viscosupplementation injections, the last being 4 months before presentation. His gout was initially manifested by

acute episodic arthritis of the toes with hyperuricemia and confirmed by the finding of intraarticular tophaceous material during knee arthroscopy. He had no history of hip arthritis. He had no history of intravenous drug use, recent hospitalization, or sick contacts. His last laboratory evaluation 1 year earlier documented creatinine 1.1 mg/ dL, aspartate aminotransferase 36 U/L, alanine aminotransferase 39 U/L, and uric acid 12.5 mg/dL. Tests for antinuclear antibodies and rheumatoid factor were negative. His daily medications were colchicine 0.6 mg, allupurinol 300 mg, diclofenac 75 mg, fluticasone propionate 50 µg nasal suspension, fexafenadine 180 mg, and hydrocodone- acetaminophen 7.5-325 mg.

His initial blood pressure was 76/50 mm Hg, respiratory rate 50, heart rate 120/min, and oxygen saturation 80% on room air. His heart sounds were normal without a murmur. His breathing was labored and there were scattered rhonchi but no basilar rales. All movements of the right hip were markedly restricted and associated with excruciating pain. There were no tophi. The patient's hypotension did not improve with a 3 L saline infusion. He was intubated and started on mechanical ventilation, a vasopressor, and intravenous vancomycin and piperacillin-tazobactam. His pulmonary secretions were bloody. The initial white blood cell count was 7700/mm3 with 28% bands, hemoglobin 16.6 g/dL, and platelet count 110,000 µL. The serum urea nitrogen was 46 mg/dL, creatinine 3.5 mg/dL, bicarbonate 18 mmol/L, anion gap 22 mmol/L, lactic acid 5.9 mmol/L, aspartate aminotransferase 340 U/L, alanine aminotransferase 86 U/L, and alkaline phosphatase 87 U/L. The arterial pH was 7.31 and pCO2 33 mm Hg.

Computed tomographic scans of the chest and the pelvis showed evidence, respectively, of pneumonia stemming from multiple septic pulmonary emboli and a right hip infection. There was no evidence of hip osteoarthritis on the scout film. Arthrocentesis of the right hip yielded 11 mL bloody purulent fluid with 182,350/ mm3 leukocytes (84% polymorphonuclear cells) and no crystals. Gram-positive cocci in clusters were evident on Gram stain. The patient died 13 hours following admission because of septic shock. His therapy had included mechanical ventilation, vancomycin, imipenem, levofloxacin, micafungin, continuous venovenous hemodialysis, and high dosages of vasopressors. MRSA was isolated from blood, synovial fluid, and sputum cultures and was susceptible to clindamycin, trimethoprim-sulfamethoxazole, rifampin, tetracycline, vancomycin, and linezolid. The isolate had a pulsed-field electrophoresis pattern indicative of the USA 300 strain type, a strain of CA-MRSA.

Methods

Reports of MRSA septic arthritis in adults (age ≥18 years) published in the English language were identified using the PubMed and the Embase databases. The following keywords were utilized: "methicillin-resistant Staphylococcus aureus," "drug resistance, bacterial," "arthritis, infectious," and "septic arthritis." The search was conducted on May 24, 2025. These sources were augmented by hand searches of reference lists in the accessed articles. Cases were excluded if the infection involved a joint with previous surgery (including prosthetic joint replacement) or a joint whose capsule had been breached by trauma, iatrogenic procedures (including joint aspiration/injection and acupuncture), or fistulae.

Results

The characteristics of MRSA native-joint septic arthritis were detailed in the published literature for 56 adult patients, of whom 42 (76%) were men (3-21). The majority represented nosocomial infections occurring in the context of comorbid medical conditions. Only 5 patients developed MRSA septic arthritis in the absence of nosocomial exposures and of other identifiable risk factors. Rheumatologic diseases were reported in 15 of the 56 patients (27%) including gout in 5, rheumatoid arthritis in 2, previous MRSA septic arthritis of another joint in 2, polyarthritis in 1, and unspecified preexisting rheumatic disease in 5. Intravenous drug use was reported by 8 patients. In 9 patients, intravenous catheters may have been the source of the infection. Polyarticular septic arthritis was reported in 13 patients (23%). Involvement of a total of 65 joints was reported; this included the knee (23), the shoulder (17), the hip (8),

sternoclavicular joint (5), wrist (3), elbow (3), lumbar facet joint (2), toes (2), ankle (1), and finger (1). Extra-articular foci of infection developed in concert with or as a result of the MRSA septic arthritis in 18 (33%) of the patients. Eight of 50 patients (16%) died from the infection, including 3 of 8 patients with polyarticular septic arthritis (38%).

Dıscussıon

The occurrence of fatal MRSA native joint septic arthritis in a health care–naive patient has rarely been reported. Although our patient had hepatitis C and gout, he enjoyed good health and was actively employed at the time that he became ill. He died from overwhelming CA-MRSA sepsis. Right hip pain was the patient's initial symptom, suggesting that the septic arthritis was an early feature of the illness. Septic arthritis of the hip is almostalways derived from hematogenous seeding of the joint (22). We hypothesize that septic arthritis of the patient's right hip resulted in septic pelvic thrombophlebitis with subsequent septic pulmonary emboli, as evidenced by the presence of right obturator muscle enlargement with fat stranding (23). We cannot exclude the possibility that the patient had right-sided bacterial endocarditis, with bacteremic seeding of the right hip and generation of septic pulmonary emboli. The overall mortality rate of MRSA septic arthritis was 16% among cases we identified in publications from 1995 to 2010. This is equivalent to the 15% mortality rate for adult monoarticular septic arthritis determined by Gupta and coworkers in their 2003 review of 47 patients with culture-proven disease (24). It is of interest that these mortality rates are at least double those determined in earlier publications. Thus, Dubost and coworkers cited mortality rates of 4 to 8% for monoarticular septic arthritis and 31 to 42% in their own case series and in their review of the literature published in 1993 (25). In 2 series, the rate of mortality was higher in patients with MRSA than methicillin-sensitive Staphylococcus aureus (MSSA) septic arthritis (3,4).

MRSA septic arthritis is mostly hospital-acquired, whereas MSSA septic arthritis is usually related to intravenous drug use (3,4). Among the 56 reported patients with MRSA septic arthritis, the most frequent predisposing factor was a preexisting rheumatic disease. Most of the patients were male, a finding consistent with that reported for MSSA septic arthritis (4). The knees and shoulders were the most commonly involved joints, a finding reflected in the 2 largest series (3,4). Two investigators have compared risk factors for MRSA septic arthritis compared with non-MRSA or MSSA septic arthritis. In both series, advanced age, recent hospitalization, and an increased number of comorbid conditions were more frequent in the patients with MRSA septic arthritis (3,4). The potential risk factors for MRSA septic arthritis that we identified in our 56 patients in the literature are summarized. Our series of 56 patients specifically excluded reported patients in whom the infection involved a joint with previous surgery or a joint whose capsule had beenbreached by trauma, iatrogenic procedures, or fistulae. We note, however, several recent reports identifying acupuncture, joint injection, and arthroscopic surgery as potential risk factors for CA-MRSA septic arthritis (26-29). CA-MRSA differs from nosocomial MRSA in terms of its epidemiology, virulence factors, clinical virulence, and antibiotic resistance patterns. There are several documented cases of life-threatening or fatal CA-MRSA infections in previously healthy children and adults (5,30,31), the most common manifestation being bilateral necrotizing pneumonia. The responsible strains typically produce the Panton–Valentine leukocidin toxin, a cytotoxin responsible for the destruction of leukocytes, which seems to be their main virulence factor. Several reports have speculated that the leucopenia observed in this infectionmay be mediated directly by Panton–Valentine leukocidin toxin and leucopenia is a poor prognostic factor in necrotizing CA-MRSA pneumonia (32).

CA-MRSA isolates are usually susceptible to clindamycin, trimethoprim-sulfamethoxazole, fluoroquinolones, and rifampin. Vancomycin is the drug of choice for the treatment of CA-MRSA septic arthritis; however, the response depends on the minimal inhibitory concentration of vancomycin. Additionally, the poor penetration of antibiotics into the periarticular space and biofilms of prosthetic joint– bone interfaces makes it

difficult to treat MRSA septic arthritis. Reports of treatment failure with vancomycin and other glycopeptide antibiotics in septic arthritis raise concern for the emergence of S aureus strains with diminished vancomycin susceptibility, termed Vancomycin- intermediate Staphylococcus aureus strains (33). More worrisome has been the emergence of strains of MRSA with true, high-level resistance to vancomycin (Vancomycin-resistant Staphylococcus aureus) (34). Two distinct molecular types of MRSA and Vancomycin-intermediate Staphylococcus aureus have been isolated from patients in Asia with septic arthritis who have undergone several courses of glycopeptide therapy (33). It is likely that the vancomycin-resistance phenotype was induced. The optimal antimicrobial regimen for S aureus with reduced susceptibility to vancomycin is unknown.

Septic arthritis is a medical emergency and requires prompt joint drainage and appropriate antibiotic therapy to prevent rapid joint destruction. In our review of the literature, MRSA native-joint septic arthritis was found to affect predominantly men and most commonly the knee and shoulder joints. A preexisting rheumatic disease was the most frequent predisposing factor. Most reported infections were nosocomial in origin but some occurred in health care–naive patients. MRSA septic arthritis can progress quickly and be associated with extra-articular foci of infection. This case highlights the rare occurrence of life-threatening CA-MRSA septic arthritis in health care–naive patients. Prompt diagnosis and intervention may be critical in improving outcomes of septic arthritis due to CA-MRSA. Antibiotics with activity against MRSA should be used in the empirical treatment of suspected septic arthritis until the antibiotic sensitivities of the causative organism are determined.

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