Case report

Missed diagnosis of septic arthritis due to invasive pneumococcal disease

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Abstract

A 61-year-old woman with severe gout, chronic kidney disease, type II diabetes, and heart failure with reduced ejection fraction was admitted with acute onset bilateral hand swelling and pain following a trauma. She was managed for a severe gout flare, but her symptoms, leukocytosis, and inflammatory markers did not improve. Six days into the hospital course, she developed fevers. Blood cultures grew Streptococcus pneumoniae. Intravenous antibiotics were started, and the patient underwent multiple incision and debridements of the bilateral hands with improvement in symptoms and clinical status. Septic arthritis secondary to S. pneumoniae is uncommon. We highlight this case to recognize that septic arthritis should always be considered when a patient presents with a painful, erythematous joint. Pneumococcal vaccination reduces the incidence of invasive pneumococcal disease, and should be prioritized for those at high risk for invasive disease and who are immunocompromised.

Introduction

Septic arthritis can cause significant morbidity and mortality, especially when diagnosis is delayed. Without early surgical and/or medical intervention, septic arthritis can lead to permanent joint destruction [1].

Septic arthritis due to S. pneumoniae is a relatively uncommon manifestation of invasive pneumococcal disease, and is an uncommon causative organism of septic arthritis. Case reviews have identified S. pneumoniae as the causative organism in 3–6% of septic arthritis cases [2]. Most commonly, septic arthritis caused by S. pneumoniae is described as polyarticular disease in the setting of bacteremia. Only about 50% of septic arthritis cases due to pneumococcus had a concomitant pneumonia or other focus of infection such as meningitis [3]. The introduction of childhood pneumococcal vaccination seems to have reduced the incidence of septic arthritis due to S. pneumoniae [4,5]. Those who are immunocompromised and not vaccinated against certain pneumococcal serotypes are at higher risk of developing invasive disease, including septic arthritis. Major risk factors that predispose patients to septic arthritis with pneumococcus include male sex, inability to walk without assistance, and underlying joint disease [6].

Here, we present a case of a female patient with bilateral hand septic arthritis secondary to invasive S. pneumoniae without additional foci of infection.

Case presentation

Patient is a woman with a past medical history of severe gout, chronic kidney disease stage III, type II diabetes, and heart failure with reduced ejection fraction, who presented to the hospital due to worsening bilateral hand pain and swelling for four days. Several months prior to presentation, the patient had discontinued colchicine, febuxostat, and allopurinol due to diarrhea. Three months prior to presentation, she had undergone debridement and removal of gouty tophi at the tips of the second and fifth distal phalanges of the right hand due to severe gout. She recovered well from this procedure without residual pain, and was in her usual state of health when her symptoms began after a box fell from a height onto her right hand. The next day, the patient’s left hand was injured by a door. The pain and swelling in both hands were persistent and progressively worsening following these injuries. Concurrently with the injury to the right hand, the patient noted a one-day history of subjective fevers, abdominal pain, and diarrhea that self-resolved.

On exam, the patient was afebrile, normotensive, and non-toxic. Gout was present in both hands, and she had redness and swelling of the right hand. She was unable to make a fist with either hand due to pain and swelling. Labs were significant for...
leukocytosis of 6200 cells/µL (4800–10,800 cells/µL), C-reactive protein of 21.8 mg/dL (<0.8 mg/dL), erythrocyte sedimentation rate of 123 mm/hr (0–30 mm/hr), lactic acid of 1.8 mmol/L (<2.5 mmol/L), hemoglobin A1c of 6.3% (<5.7%), and uric acid of 11.9 mg/dL (2.5–6.5 mg/dL). MRI of the right thumb on hospital day one showed fluid collections around the first metacarpophalangeal joint, suspicious for septic arthritis vs gout flare. These findings were interpreted as consistent with a new gout flare. After orthopedic evaluation, the patient was started on high dose prednisone (60 mg daily) to treat a gout flare.

On hospital day six, patient developed a fever to 100.4 °F, and despite six days of prednisone, her pain and swelling remained unchanged. She also continued to have significant leukocytosis. Blood cultures obtained as part of a fever workup resulted positive with S. pneumoniae on hospital day seven, after which Infectious Diseases was consulted. Ceftriaxone was started. Subsequent blood cultures resulted as no growth. Susceptibility testing later revealed the organism to be sensitive to penicillin, ceftriaxone, levofloxacin, and trimethoprim/sulfamethoxazole. A transthoracic echocardiogram was significant for an ejection fraction of 10% with severe left ventricular dilatation and no valvular vegetations. MRI of the left wrist performed for surgical planning on hospital day nine demonstrated multiple fluid collections with findings consistent with abscess formation at the distal radioulnar joint and diffuse muscular edema (Figs. 1 and 2).

Three separate incision and drainage (I&D) of the bilateral wrists and right first carpometacarpal joints were performed on hospital days 11, 13, and 15. The first I&D yielded significant purulent material mixed with gouty tophi. Cultures were sent from each I&D. The gram stains performed on the joint fluid showed gram positive cocci in pairs, but the cultures did not grow any organisms. Following the I&D procedures, the patient’s symptoms of pain and swelling improved and the leukocytosis decreased. The patient was discharged on hospital day 19 with an upper extremity long-term intravenous catheter to receive a four-week course of ceftriaxone for treatment of septic arthritis, and follow up with infectious diseases. While there are no published Infectious Diseases Society of America guidelines on treatment duration for septic arthritis, the four-week duration was chosen based on review of the literature and consideration of the patient’s comorbidities [4].

Nine days following discharge, the patient was readmitted with fevers, worsening bilateral hand pain, and cloudy drainage from the right wrist surgical site. On presentation, the patient was afebrile, normotensive, and non-toxic appearing. Notable lab findings included a leukocytosis of 6300 cells/µL, C-reactive protein of 4.9 mg/dL, and erythrocyte sedimentation rate of 114 mm/hr. X-rays performed at this time noted erosions consistent with prior bony changes without findings of osteomyelitis. I&D was performed on hospital day one. Cultures were obtained from the operating room, and there were no growth of bacteria from them. The patient received ceftriaxone while inpatient and, per her request, was transitioned to cefdinir to complete a six-week course of antibiotics in the outpatient setting.

Patient followed up in Infectious Diseases clinic two months post discharge from her second hospitalization, at which time she had completed the six-week course of cefdinir. She continued to note right hand pain and swelling. At this time, she denied left hand pain or swelling. Her right-hand pain was not as severe as during her hospitalizations. Because of her ongoing pain and swelling, the patient was referred to the Emergency Department as well as Orthopedics, but she was unable to immediately present for care. On orthopedics follow up, patient’s symptoms of pain and swelling had improved except for new pain at the tip of the right thumb. Repeat x-rays performed by the orthopedist did not demonstrate new erosive changes or other findings concerning for osteomyelitis. She underwent further debridement of gouty tophi of the right thumb one month later.

**Discussion**

There are multiple factors contributing to this patient’s presentation and disease course. Perhaps the most significant contribution is her history of severe gout. She has structural alterations of the bones of her hands following multiple prior debridements of tophi deposition. Structural alterations of the bones can act as points where bacteria can seed infection due to turbulent blood flow [6]. In addition, the patient’s history of repeated gouty flares confounded the initial clinical decision making, and likely contributed to anchor bias at the time of her initial presentation. Per a case series review by Kang et. al., patients with gout, elevated serum uric acid levels, and renal insufficiency with swollen and painful joints are typically found to have non-infectious arthritis [7]. However, a gout flare should respond to high dose steroids within five to seven days [8–10]. The patient’s lack of response to high dose steroids should have increased the suspicion for an infectious process. Hyperglycemia and relative insulin deficiency caused by type II diabetes mellitus has multiple effects on the host response to infection. This includes decreased cytokine production and neutrophil and macrophage dysfunction [11]. This patient’s diabetes was relatively well controlled, but intermittent hyperglycemia can contribute to immune dysfunction [11].
The development of this patient’s bacteremia with *S. pneumoniae* is unclear. She had experienced one day of subjective fevers and diarrhea concurrently with the pain and swelling of her hands, suggesting a possible systemic infection at that time. A systemic illness could have caused a transient pneumococcal bacteremia, as systemic illness causing pneumococcal septic arthritis has been previously reported [12]. However, invasive pneumococcal disease does not typically present with gastrointestinal symptoms. While *S. pneumoniae* was not isolated from cultures taken in the operating room (antibiotics were started before surgical intervention), the most likely causative organism of her septic arthritis is *S. pneumoniae* as there were gram positive cocci on gram stains sent from operating room cultures, it was the only organism identified in her blood cultures, and she improved clinically on appropriate antibiotic therapy.

Current recommendations for the treatment of septic arthritis include prompt arthrocentesis for diagnostic and therapeutic purposes, as well as irrigation and debridement. This is in addition to antibiotic therapy tailored initially to the patient’s risk factors, and subsequently based on culture data, when available. Septic arthritis due to pneumococcus should be considered in individuals with polyarticular disease or prior joint damage [2]. An additional focus of infection, i.e., pneumonia, due to pneumococcus may not be concurrently diagnosed [2].

Pneumococcal vaccination should be provided to individuals under the age of sixty-five at risk for invasive pneumococcal disease. These risks include HIV infection, diabetes mellitus, solid organ transplant recipients, chronic kidney disease, and other immunodeficient states [13]. Pneumococcal vaccination was associated with significantly decreased rates of invasive disease leading to mortality amongst the youngest and oldest populations studied [5]. Our patient had not received either the conjugate or the polysaccharide vaccines. Vaccination could have mitigated or prevented her hospitalization, although the serotype of the *S. pneumoniae* with which she was infected is unknown.

Our microbiology lab does not routinely serotype *S. pneumoniae* isolated from cultures. Serotypes not included in the pneumococcal vaccinations can cause invasive disease even in those who have been vaccinated [14].

**Conclusion**

In summary, gout and septic arthritis can have a similar presentation. Given the significant morbidity and mortality attributed to septic arthritis, through evaluation should be undertaken early in a patient’s hospital course to exclude infection when gout is suspected. This can include prompt and early arthrocentesis and operative debridement as well as consultation with Infectious Diseases. Vaccination against *S. pneumoniae* in immunocompromised populations can help prevent invasive pneumococcal disease.

**Consent**

"Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request".

**CRediT authorship contribution statement**

JC-Conceptualization of case report, patient care, writing and editing manuscript, RI-Writing and editing manuscript, LC-Writing and editing manuscript, conceptualization of case report, SS-Conceptualization of this case report and accompanying images. A copy of the manuscript, conceptualization of case report and accompanying images. A copy of the

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