UTJMS 2026 July 15, V16(N1):e1-e10 doi: 10.46570/utjms-2026-1993

Streptococcus pneumoniae Septic Arthritis in a Vaccinated Host: Case Report

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Received 2/4/2026

Accepted for publication 6/9/2026

Published 7/15/2026

Abstract

Streptococcus pneumoniae septic arthritis is an uncommon infection, rarely encountered in the US since the introduction of pneumococcal vaccination. We present a case of *S. pneumoniae* septic arthritis in a patient with HIV from a serotype not covered by pneumococcal vaccines: the patient had previously received PPV-23 and PCV-13 pneumococcal vaccination in addition to PCV-20 pneumococcal vaccination a year before presentation. This case highlights the importance of *S. pneumoniae* as a pathogen in people with HIV regardless of vaccination status, and the potential for pneumococcal disease from serotypes not covered in the currently available vaccines (serotype replacement).

Keywords: Streptococcus pneumoniae, Septic Arthritis, Vaccine

UTJMS 2026 July 15, V16(N1):e1-e10 doi: 10.46570/utjms-2026-1993

1. Introduction

Despite the high frequency of *Streptococcus pneumoniae* infection in the general population, *S. pneumoniae* remains an uncommon cause of septic arthritis. It is the causative agent in <5% of native joint septic arthritis but is rarely cultured from joint fluid (1-5). Elderly patients and patients with diabetes mellitus, rheumatoid arthritis, HIV, splenectomies, gout, malignancies, and cardiovascular diseases appear to be the most vulnerable to *Streptococcus pneumoniae* septic arthritis (6). *Streptococcus pneumoniae* septic arthritis can involve any joints, but it is usually monarticular and most prominently affects knees and hips, including prosthetic joints. Only a minority of infections occur in the absence of pneumonia with or without bacteremia (7).

The incidence of *Streptococcus pneumoniae* septic arthritis has been decreasing since the introduction of pneumococcal vaccines into routine immunization schedules. There are two general types of pneumococcal vaccine currently available in the US, which cover only a subset of the over 100 known serotypes: polysaccharide vaccines (PPSV23) and conjugate vaccines (PCV7, PCV13, PCV15, PCV20, PCV21). Conjugate vaccines stimulate mucosal immunity, and polysaccharide vaccines stimulate antibody production without stimulating mucosal immunity (8).

All currently available pneumococcal vaccines cover the following serotypes: 3, 7F, 19A, 22F, and 33F. When joint infections occur, they are usually due to serotypes not covered in the 7-, 13-, 15-, 20-, 21-, or 23- valent vaccines (4). In one retrospective cohort study of *S. pneumoniae* septic arthritis in 10 patients (9), serotypes were identified for 4 patients (11D, 19A, 23F, 24F): of these 4 patients, one patient had received the PCV13 vaccine and was infected by a non-vaccine serotype (24F), and the other had received the PCV7 vaccine and was infected by serotype 19A. To date, no other published literature exists regarding the serotype of pneumococcal septic arthritis in appropriately vaccinated hosts. We present a patient with HIV and documented pneumococcal vaccination who developed septic arthritis from a non-vaccine *Streptococcus pneumoniae* serotype, emphasizing the ongoing risk of invasive pneumococcal osteoarticular infection despite vaccination.

2. Case Report

A 42-year-old female was evaluated for right hip pain. She was diagnosed with HIV in 2006 and received PPSV23vaccination in 2006, 2012, 2013, , PCV13 in 2016, and PCV 20 in March 2023. Shortly after that time, she developed bilateral hip pain and underwent 3 injections bilaterally in the greater trochanteric bursa with triamcinolone acetonide (40mg) and lidocaine, each time with some improvement in her hip pain. In November 2024, she was hospitalized with suspected community-acquired pneumonia and exacerbation of asthma

Six weeks later, she presented with the acute onset of severe, right-sided leg and groin pain. Her VL was undetectable (<30 copies/ml), and her CD4 count was 268 cells/ml on cabotegravir/rilpivirine intramuscularly and subcutaneous lenacapavir. She had no pulmonary complaints or signs of meningitis, and CXR was negative. Blood cultures on admission were positive for *S. pneumoniae,* and the patient was started on intravenous ceftriaxone 2 grams daily. An MRI of the right hip showed degenerative changes in the hip joint, and a possible small tear of the superior labrum, without avascular necrosis or fracture. Approximately 48 hours after admission, a hip aspirate revealed a white blood cell count of 31,000 cells/ml (95% neutrophils with peripheral white blood cell count of 12,000 cells/ml) with negative Gram stain and culture. The patient underwent a right hip arthrotomy with irrigation and debridement approximately 72 hours after admission, and intraoperative fluid cultures were negative. The patient declined intravenous antibiotics and was treated with oral levofloxacin 750 mg daily for 4 weeks, then oral cephalexin 500 mg three times a day without improvement. A CT scan of the right hip in February 2025 revealed an abscess in the right tensor fascia lata, which was drained: the Gram stain and culture were negative. The patient again declined intravenous antibiotics and was treated with 6 weeks of oral cephalexin 500 mg three times daily, with complete resolution of hip pain. Serotyping of the pneumococcal blood isolate revealed serotype 34 (non-vaccine serotype).

3. Discussion

S. pneumoniae remains an uncommon cause of osteoarticular infections in the era of pneumococcal vaccination but continues to cause invasive disease in selected populations, including

people with HIV (PWH). This case highlights several important considerations: the persistence of invasive pneumococcal disease (IPD) despite appropriate vaccination, severe infection caused by non-vaccine serotypes, and the diagnostic challenges of pneumococcal osteoarticular infections.

The introduction of pneumococcal vaccines has resulted in a substantial decline in IPD; however, this decline has been associated with a shift in serotype distribution, with IPD increasingly caused by serotypes not covered in any of the currently available vaccines (10), a phenomenon known as serotype replacement (11). PWH who are not on antiretroviral therapy (ART) are at significant risk of invasive pneumococcal disease (12, 13). In the era of effective ART and pneumococcal vaccination, the incidence of IPD has declined in PWH but remains elevated above the incidence in the general population (14).

Pneumococcal septic arthritis typically occurs during episodes of bacteremia. In this case, blood cultures revealed the presence of *S. pneumoniae*, without concurrent pneumonia or osteoarticular infection. The patient had a history of multiple corticosteroid injections in the greater trochanteric bursa, which could have led to localized immunosuppression or joint instability, possibly allowing for bacterial invasion. Broad range bacterial PCR or syndromic joint panels that include *S. pneumoniae* may be useful for microbiologic diagnosis in these settings.

In summary, this case highlights the continued relevance of *S. pneumoniae* as a pathogen in PWH regardless of vaccination status or virologic control. It also highlights the potential for future increases in IPD from non-vaccine serotypes. Clinicians need to maintain a high index of suspicion for infections from *S. pneumoniae* in PWH regardless of CD4 count, ART therapy, or vaccination status.

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