


CASE REPORT

Bilateral native knee septic arthritis due to *Propionibacterium acnes*; a case report and review of literature

Abdul Rehman Arain¹  | Keegan Cole¹ | Muhammad Moral¹ | Sean Thadani² | Andrew Rosenbaum¹

¹Albany Medical Center, Albany, NY, USA

²St. Matthew's University, West Bay, Cayman Islands

Correspondence

Abdul Rehman Arain, Department of Orthopaedic Surgery, Albany Medical Center, 44 New Scotland Avenue, Albany, NY, 12202, USA.
Email: mrbonelover@gmail.com

Abstract

Propionibacterium acnes should be considered in any case of indolent septic arthritis. Cultures should be followed for 2 weeks as our cultures were negative for 7 days before growing *P. acnes*. Irrigation and debridement followed by antibiotics is the standard of care.

KEYWORDS

bilateral knee *P. acnes* infection, bilateral native knee septic arthritis, indolent native knee septic arthritis, native knee septic *P. acnes* infection

1 | INTRODUCTION

We report on the first case of bilateral septic arthritis of native knees secondary to *P. acnes* infection in a 69-year-old female patient with no inciting event. After an equivocal clinical presentation, the patient was successfully treated with irrigation and debridement followed by a prolonged course of antibiotics. Cultures remained negative for 7 days before growing *P. acnes*. Our case illustrates the importance of considering *P. acnes* as a cause of indolent septic arthritis in a native joint for patients with a benign presentation and initial negative cultures.

Historically, *Propionibacterium acnes* (*P. acnes*) has been implicated as a pathogen in brain abscesses, ocular infections, and facial acne. Recently, it has been shown to be a common pathogen associated with prosthetic joint infections (PJI) of shoulder arthroplasties with a reported incidence ranging from 12% to 51.3% of all PJI.^{1,2} However, it is rarely implicated in native joint infections and is usually associated with an inciting event such as surgery, arthrocentesis, or therapeutic steroid injection.³⁻⁵ *Propionibacterium acnes* normally inhabits hair follicles and sebaceous glands of the skin. Therefore, regions of the body devoid of hair follicles such as the knee are unexpected sites of infection and add to

its unique diagnostic challenge. Typical signs or symptoms of septic arthritis include severe joint pain limiting motion, as well as warmth, swelling, and erythema. Constitutional symptoms include fevers, chills, and malaise. Thus, the indolent clinical course which is often absent with *P. acnes*, as well as the delayed anaerobic growth, may contribute to under-diagnosis of native joint infections by this microbe.⁵⁻⁷

To our knowledge, there are a total of six reported cases of native knee *P. acnes* septic arthritis, only two of which are absent of any predisposing events. In both of these cases, the patients had an underlying diagnosis of rheumatoid arthritis and were successfully treated with long-term parenteral antibiotics.⁵ We report on the first documented case of *P. acnes* bilateral septic arthritis in native knees in a patient with no known precipitating event. We also provide a brief literature review with a focus on treatment and diagnostic guidelines.

2 | CASE REPORT

The patient is a 69-year-old female with a remote history of gastric bypass surgery presenting with a 10-day history of vague abdominal pain, chills, and diarrhea. She was admitted and treated for food poisoning and dehydration. She also

TABLE 1 Septic arthritis serum and joint aspirate inflammatory maker

	<i>Propionibacterium acnes</i> case		Normal	Classic septic arthritis
Serum				
WBC (10 ³ /μL)	11.0		4.1-9.3	>10
ESR (mm/h)	37		<8	>5
CRP (mg/L)	102		<25	>30
Joint aspirate				
	L	R		
WBC (per mm ³)	77 370	73 140	<200	>50 000
% Neutrophils	97	94	<25%	>50%

Abbreviations: CRP, C-reactive protein; ESR, Erythrocyte sedimentation rate; WBC, White blood cell.

had a 5-day history of bilateral knee swelling and pain, especially with knee flexion and ambulation. Her abdominal complaints resolved but her bilateral knee pain persisted, which prompted an orthopedic consultation.

Upon evaluation, she was found to be afebrile with stable vital signs. Laboratory results revealed elevated serum inflammatory markers, which included a white blood cell (WBC) count of 11, erythrocyte sedimentation rate (ESR) of 37, and C-reactive protein (CRP) of 102. Her urine cultures, blood cultures, and Lyme antibodies were negative. Her knees were nonerythematous, mildly swollen, and demonstrated pain bilaterally with terminal active flexion. Each knee was aspirated and sent for cell count and cultures. Aspirates revealed 77 000 and 73 000 WBC, 97% and 94% percent neutrophils, and no evidence crystals in the right and left knees, respectively (Table 1). She was started on empiric vancomycin.

The next day the patient's pain and swelling continued to persist, and cultures remained negative. She was taken to the operating room bilateral knee irrigation and debridement. Medial parapatellar arthrotomies were performed, showing purulent-appearing fluid which was evacuated and thoroughly irrigated. Cultures resulted in *P. acnes* 7 days after the initial aspirate. The infectious disease service was then consulted, and the patient treated with 6 weeks of intravenous ceftriaxone. At 6-month follow-up, she had complete resolution of her symptoms.

3 | DISCUSSION

Propionibacterium acnes is a nonspore forming, anaerobic, Gram-positive bacillus with low pathogenicity. The microbe typically colonizes the shoulder and axillary regions which have a high density of deep sebum-rich hair follicles. During surgery, scalpel incisions can slice through these follicles, potentially seeding the bacteria.^{8,9} Furthermore, *P. acnes* can encapsulate itself in a protective biofilm through the secretion

of an extracellular matrix on the follicular surface.¹⁰ Routine preoperative surface sterilization thus does not adequately eradicate the pathogen, while the biofilm serves as a barrier to the penetration of antibiotics.¹¹⁻¹³

The diagnosis of *P. acnes* infections is often challenging and lead to treatment delays. Patients are usually afebrile and present with normal serum inflammatory markers. In our case, only the CRP was significantly elevated. Recent studies involving *P. acnes* in shoulder arthroplasty infections showed that the ESR and CRP were elevated in only 10% of patients.⁶ Additionally, the clinical examination is usually equivocal with mild-to-moderate pain during joint range of motion as documented in our patient. With “classic” septic arthritis, patients present with extreme pain on movement of the joint. The most widely accepted test to diagnose septic arthritis is a sterile joint aspiration. However, this has decreased utility in identify *P. acnes* infections since positive cultures may take up to 15 days to grow in enriched broth. In our case, the patient's history lacked a precipitating event which would predispose her to joint inoculation with *P. acnes*.

However, the elevated serum CRP, high aspirate WBC count, and lack of clinical improvement were concerning for septic arthritis. Our case underscores the importance of considering atypical microbes such as *P. acnes* as a cause of possible joint infections, especially in patients with a benign clinical course and equivocal laboratory markers. We also recommend following all joint aspirate cultures for at least 2 weeks increasing diagnostic sensitivity of delayed colonizers.

The standard of care following the diagnosis of septic arthritis is irrigation and debridement as well as treatment with culture-specific antibiotics. *P. acnes* has a significant association with acne vulgaris, medical device-related infections, and deep-seated postoperative infections. Recent improvements in the diagnosis and treatment of prosthetic joint infections, particularly shoulder prosthesis, have identified *P. acnes* as the leading causative organism. Empiric antibiotic coverage for commonly implicated bacteria such as *Staphylococcus aureus* may not cover the more indolent and less common pathogens such as *Neisseria gonorrhoeae*, *Haemophilus influenzae*, and *P. acnes*. Most studies suggest clindamycin and vancomycin as the first-line treatment for deep-seated *P. acnes* infections. In the presence of clindamycin-resistant strains, intravenous penicillins and cephalosporins can be considered as viable alternatives while awaiting culture sensitivities.^{4,5} Furthermore, combination antibiotic therapy with rifampin and daptomycin has shown promising results in eradicating up to 67% of *P. acnes* biofilms.^{10,11}

4 | CONCLUSION

Clinicians should consider *P. acnes* on the list of any differential involving septic arthritis, especially in patients

presenting mild, vague symptoms with mildly elevated clinical and inflammatory markers. In most cases of *P. acnes*-associated PJI and native joint infections, initial cultures are negative. Therefore, we recommend all joint cultures be held for 2–3 weeks to rule out an indolent *P. acnes* infection.

Treatment guidelines for native *P. acnes* joint infection are limited. However, based on limited data available, we recommend surgical debridement in all healthy surgical candidates. Antibiotic management requires a multidisciplinary approach with involvement of infectious disease. Although there is no consensus in an ideal antibiotic regimen, prolong courses of clindamycin and ceftriaxone have shown good outcomes in a limited number of reported cases. IV-vancomycin has been shown to be adequate for empiric treatment prior to speciation.

CONFLICT OF INTERESTS

The authors declare that they have no competing interests and nothing to disclose.

AUTHOR CONTRIBUTIONS

ARA, KC, MM, ST, AR all participated in the diagnosis and treatment of this patient. All authors contributed to the preparation of this manuscript equally. ARA is the lead author and was additionally responsible for submission and making appropriate edits when needed. All authors approved of the final manuscript.

INFORMED CONSENT

Written informed consent was obtained from this patient authorizing the publication of case details and associated images. The study protocol was approved by the institute's committee on human research.

ORCID

Abdul Rehman Arain  <https://orcid.org/0000-0001-6625-7675>

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