CASE REPORT

Rare case of *Corynebacterium striatum* septic arthritisMoni Roy,¹ Sharjeel Ahmad²

¹Department of Internal Medicine, University of Illinois College of Medicine at Peoria, OSF Saint Francis Medical Center, Peoria, Illinois, USA

²Department of Internal Medicine, Section of Infectious Diseases, University of Illinois College of Medicine at Peoria, Peoria, Illinois, USA

Correspondence to

Dr Moni Roy,
moniroy27@gmail.com

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SUMMARY

Corynebacterium species are aerobic, Gram-positive bacilli that are commensal organisms of skin and mucosal membranes. Although its pathogenicity is well established, *Corynebacterium striatum* is frequently isolated in cultures and generally regarded as a contaminant. Rarely, this bacterium causes septic arthritis. We present a case of right shoulder joint septic arthritis due to *C. striatum* in a lung-transplant recipient with end-stage renal disease. A brief review of the literature regarding *C. striatum* septic arthritis is also a part of this report.

BACKGROUND

Corynebacterium species is ubiquitous in nature. It can be a contaminant in blood and body fluid cultures but has been implicated in a variety of infections. We present a case of shoulder joint infection in an immunosuppressed host. This case highlights the need to recognise this organism as a possible cause of septic arthritis in appropriate clinical context.

CASE PRESENTATION

A 77-year-old man with medical history of bilateral lung transplant in 2001 for severe chronic obstructive pulmonary disease, on immunosuppressive therapy and haemodialysis-dependent end-stage renal disease presented to the emergency department with 1 week history of progressively right-sided shoulder pain, rated 6/10 in intensity, worse with palpation or any movement of shoulder and not relieved with the use of opioids. There was no preceding trauma or injury. The patient denied any associated chest pain, shortness of breath, abdominal pain, diaphoresis, fever or chills. Other medical history was significant for hypertension, hyperlipidaemia and pancytopenia related to the use of immunosuppressive therapy. He was a former 50 pack-year smoker with no history of injection drug use, recent travel or tick bites. Family history was significant for leukaemia in his brother.

Physical examination was significant for diffuse right upper extremity oedema, with tenderness on palpation over the right deltoid. Mild warmth was noted over right shoulder with no erythema. There was limitation of range of motion due to pain. He was initially discharged home from the emergency department on symptomatic therapy with muscle relaxants. The patient returned with worsening pain at the site the very next day and was admitted for further evaluation and management. The

patient was found to have a small ulcer with surrounding erythema at the arteriovenous fistula site.

INVESTIGATIONS

Erythrocyte sedimentation rate was 75 mm/hour, serum C reactive protein was 41.37 mg/L, complete blood count showed anaemia, thrombocytopenia at baseline with no leucocytosis (table 1). The patient underwent arthrocentesis with 50 cc of blood tinged synovial fluid. The initial synovial fluid aspirate showed with 32 700 total nucleated cells with no crystals noted (table 2). Gram stain showed many white cell count and Gram-positive bacilli with cultures showing growth of *Corynebacterium striatum*. Blood cultures showed no evidence of bacteraemia. Operative synovial fluid cultures obtained 24 hours later grew the same organism. To identify the organism, the synovial fluid body was inoculated in aerobic and anaerobic bottles and on thin blood-agar plate. A positive culture was noted in the anaerobic bottle and the agar plate. Vitek 2 ANC card (bioMérieux, Marcy l'Etoile, France) was used to identify the strain as *C. striatum*. As no standardised drug-susceptibility testing is available for this organism, E-test was used to determine the minimum inhibitory concentration (MIC) and the results were as follows: ceftriaxone 23 µg/mL and vancomycin 0.38 µg/mL.

TREATMENT

The patient was started empirically on vancomycin 1 g intravenous posthaemodialysis thrice weekly

Table 1 Complete blood count on admission

Component	Value	Reference range	Units
WCC	5.63	4.00–12.00	10(3)/mCL
RBC	2.54	4.40–5.80	10(6)/mCL
Haemoglobin	7.1	13.0–16.5	g/dL
Haematocrit	23.8	38.0–50.0	%
Platelet count	35	140–440	10(3)/mCL
Neutrophils	53.7	40.0–68.0	%
Lymphocytes	35.3	19.0–49.0	%
Monocytes	10.8	3.0–13.0	%
Eosinophils	0.0	0.0–8.0	%
Basophils	0.2	0.0–1.0	%
Absolute neutrophils	3.02	1.40–5.30	10(3)/µL
Absolute lymphocytes	1.99	0.90–3.30	10(3)/µL
Absolute monocytes	0.61	0.10–0.90	10(3)/µL
Absolute eosinophils	0.00	0.00–0.50	10(3)/µL
Absolute basophils	0.01	0.00–0.10	10(3)/µL

RBC, red blood cells; WCC; white cell count.

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Table 2 Right shoulder arthrocentesis fluid cell count and differential

Clarity	Turbid	
Colour	Bloody	
Volume	50.0	mL
Fluid RBC count	230 000	/mm ³
Fluid total nucleated cell count	32 700	/mm ³
Neutrophils%	90	%
Lymphocytes%	4	%
Monocytes%	6	%
Eosinophils%	0	%
Macrophages%	0	%
Plasma cell%	0	%

RBC, red blood cells.

and ceftriaxone 1 g intravenous daily. He underwent shoulder arthroscopy with intra-articular excisional debridement and decompression with acromioplasty. Debridement of the anterior, superior and posterior labrum and biceps stump was also performed. The synovial fluid was sanguineous with no frank pus. Once the operative synovial cultures showed growth of *C. striatum* and drug-susceptibility test results were available, antibiotic coverage was narrowed to vancomycin which was continued at 1 g intravenous postdialysis. He subsequently underwent interposition graft placement. Incision was made over the infected part of the graft, which was dissected out and excised. End-to-end anastomosis was completed. The graft tissue cultures were negative for any growth but the patient was on 3 days of intravenous vancomycin before the tissue culture was obtained.

OUTCOME AND FOLLOW-UP

The antimicrobial regimen was simplified to vancomycin only. The initial plan was to continue dosing vancomycin at 1 g intravenously thrice weekly after each haemodialysis session for 4 weeks starting from the day of joint debridement, with the weekly vancomycin trough target being 15–20 µg/mL. He was followed as an outpatient and eventually the treatment needed to be extended for a total of 4 months until resolution of the symptoms and normalisation of C reactive protein levels.

DISCUSSION

Coryneform bacteria are non-sporulating, non-acid fast, pleomorphic, non-branching, Gram-positive rods that are aerobic and facultative anaerobic. They are ubiquitous in the environment and commonly colonise the skin and mucous membranes of humans. *Corynebacterium diphtheriae* is the most well-known species of the group but other lesser known species have emerged as pathogens over the past few years. *C. striatum* is distinguished from other corynebacteria by being catalase positive, reducing nitrates and using glucose and sucrose. Souza *et al*¹ have reported the ability to adhere to hydrophilic and hydrophobic abiotic surfaces and biofilm formation in *C. striatum* strains isolated during a nosocomial outbreak in Rio de Janeiro, Brazil. In addition to the ubiquitous nature of the bacteria, the diagnosis and treatment is further complicated by its relatively slow growth, and the phenotypic difficulty in laboratory identification.² The species also has prominent striated appearance on Gram stain. Over the past few years, the organism has been increasingly reported as a pathogen.³ Cases of infective

endocarditis, meningitis, vertebral osteomyelitis, nosocomial respiratory outbreaks and rarely septic arthritis have been reported in the medical literature.^{4–8}

As per our literature review using PubMed, there have been six reported cases of septic arthritis due to *C. striatum* (table 3). Two of six reported cases were septic arthritis of the shoulder joint. The first case of shoulder joint infection described in the medical literature was an 80-year-old woman with a history of myasthenia gravis treated with azathioprine. The patient initially presented with axillary swelling and underwent drainage of axillary swelling. CT image of the shoulder showed joint effusion, and the joint fluid culture grew *C. striatum*.³ The second case was in an immunocompetent 59-year-old woman who presented with pain after an outpatient steroid joint injection.⁹ Both cases were possibly due to inoculation from prior instrumentation which does increase a risk of joint infection with *C. striatum*. Ours is the third reported case of shoulder joint septic arthritis. In our patient, haematogenous spread of the pathogen from the infected fistula was the likely primary source of infection as no recent joint instrumentation, trauma or joint injection was reported. Although the graft tissue cultures remained negative, the patient had already received antibiotic coverage prior to obtaining tissue to culture.

Vancomycin has been the most widely used antimicrobial for *C. striatum* septic arthritis. Emerging antibiotic resistance has been reported to tetracyclines, quinolones, penicillins, cephalosporins, trimethoprim-sulfamethoxazole, clindamycin, erythromycin, imipenem and linezolid.^{10–15} There has been no reported case of vancomycin resistance yet. Two cases that were not treated with vancomycin included a healthy physician who developed elbow joint infection after a scalpel injury.¹⁶ He was started on vancomycin but later the antibiotic was switched to fluoroquinolones due to vancomycin-related side effects. The second patient was empirically started on cloxacillin and ceftriaxone on presentation and later switched to ceftriaxone based on drug-susceptibility testing.⁹ The average duration of treatment varied from 2 weeks to 2 months (table 3). In our patient a 4-month long course of treatment was required due to non-resolving symptoms and persistently elevated inflammatory markers. Vancomycin dosages of 15–20 mg/kg given every 8–12 hours are required for most patients with normal renal function to achieve the suggested serum concentrations when the MIC is ≤1 mg/L. In the case of our patient, the dose had to be modified in light of altered renal function. While no studies regarding shoulder joint fluid levels are available, a recent study by Roy *et al*¹⁸ showed that vancomycin achieves therapeutic levels in the synovial fluid of the knee with a standard intravenous prophylactic dose, clearance from the knee is rapid, and the synovial fluid concentration may be subtherapeutic for hours before the next intravenous dose is given. The mean serum vancomycin level in this study was 24.9 µg/mL with the mean joint fluid concentration following intravenous administration being 6.8 µg/mL. Given the low MIC value for our isolate as obtained by E-test, we were probably able to achieve therapeutic levels for most of the duration of treatment for this infection with the immunocompromised status of patient affecting his ability to clear this infection, thus necessitating prolonged antimicrobial therapy.

Recurrent isolation of *C. striatum* from a sterile body site should prompt early infectious-disease consult and laboratory request for drug-susceptibility testing. Susceptibility testing is not routinely performed otherwise by most laboratories as this organism is considered a contaminant in most clinical situations. Early detection and appropriate treatment of this infection is

Table 3 Reported cases of *Corynebacterium striatum* septic arthritis, risk factors for infection and antibiotics used

Year of report	Age	Gender	Joint involved	Risk factors	Immunosuppressed	Antibiotics used	Reference number
1998	51	Female	Elbow	Scalpel injury	No	Started on vancomycin, later switched to ciprofloxacin for total 4 weeks.	16
2007	87	Male	Knee	Recent trauma, venous ulcers	No	Vancomycin for 2 weeks.	10
2008	80	Female	Shoulder	Recent joint aspiration	Yes	Started on vancomycin, developed <i>Clostridium difficile</i> colitis. Died from septic complications.	8
2008	80	Female	Knee	Prosthetic joint	No		8
2013	59	Female	Shoulder	Joint injection	No		9
2014	84	Male	Knee	Recent fall, joint arthrocentesis	No		17

important especially in immunosuppressed patients and likely to lead to improved clinical outcomes.

Learning points

- ▶ *Corynebacterium* species commonly colonise the skin and mucous membranes of humans and isolation from cultures is often dismissed as a contaminant. Repeated isolation of the same organism from sterile body fluid, however, should raise suspicion of infection due to this organism, especially in immunocompromised individuals.
- ▶ Septic arthritis due to *Corynebacterium striatum* is rare.
- ▶ Standardised drug-susceptibility testing is not available for this organism but vancomycin is the most commonly used antimicrobial for the treatment of infection with no reported case of vancomycin resistance as yet.

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