

Corynebacterium jeikeium native valve infective endocarditis case report: a confirmed microbiological and pathological diagnosis from heart valvular tissue

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Background

The Modified Duke criteria is an important structured schematic for the diagnosis of infective endocarditis (IE). *Corynebacterium jeikeium* is a rare cause of IE that is often resistant to standard IE anti-microbials. We present a case of *C. jeikeium* IE, fulfilling the Modified Duke pathological criteria.

Case summary

A 50-year-old male presented with left leg peripheral vascular disease with septic changes requiring amputation. Routine echocardiography post-amputation demonstrated severe aortic valve regurgitation with vegetations that required valve replacement. Two initial blood cultures from a single venepuncture showed *Streptococcus mitis* which was treated with penicillin G prior to surgery. Subsequent aortic valve tissue cultured *C. jeikeium* with suggestive IE histological valvular changes and was successfully treated on a prolonged course of vancomycin.

Discussion

This is the first *C. jeikeium* IE case diagnosed on heart valvular tissue culture and highlights the importance for the fulfilment of the Modified Duke criteria in diagnosing left-sided IE. Mixed infection IE is rare, and this case possibly represents an unmasking of resistant *C. jeikeium* IE following initial treatment of penicillin G.

Keywords

Corynebacterium jeikeium • Infective endocarditis • Modified Duke • Case report

Learning points

- *Corynebacterium jeikeium* is a rare cause of infective endocarditis (IE) and is typically multidrug resistant.
- It is important to try to fulfil the Modified Duke criteria when diagnosing a patient with left-sided IE.
- Clinicians should be aware of the complexities associated with the microbiological diagnosis of IE from heart valve tissue.

Introduction

Infective endocarditis (IE) is an important infection with high mortality, if not treated appropriately and timeously.^{1,2} *Staphylococcus aureus*

and Viridans streptococci constitute up to 80% of all cases of IE.¹ Commensal flora from the skin, mouth, and gut are significant sources of pathogenic micro-organisms causing IE.^{1,3} *Corynebacterium* species IE is rare, and is found in only 0.4% of all IE infections.^{1,4}

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The Modified Duke criteria provides a structured schematic for the diagnosis of left-sided IE based on microbiological, echocardiographic, and clinical findings.⁵ Repetitive blood cultures form the basis for microbiological diagnosis in most IE cases.^{1–3} Microbiological and histological diagnosis from heart valves remain an important part of the Modified Duke criteria, even though heart valve culture has a sensitivity of only 6–26%.^{6,7} The authors describe a case of *Corynebacterium jeikeium* IE confirmed on both culture and histology from heart valve tissue.

0.016 µg/mL. Five subsequent blood cultures taken from different anatomical sites and days did not yield any bacterial growth. The patient's surgery was delayed until the complete resolution of local wound sepsis due to the infection risk posed to a new aortic valve. The patient also received targeted penicillin G (3 million units 4 hourly) for 6 weeks and gentamicin (240 mg daily) IVI treatment for 2 weeks before surgery. The patient remained stable and had no pre-operative complications.

The patient had a pre-operative EuroSCORE of 3.5%. His procedure consisted of an aortic valve replacement (21 mm St Jude Regent

Timeline

Day	Date	
0	28 December 2019	Admitted with peripheral vascular disease with septic lesions to left leg and underwent an above knee amputation
14	11 January 2019	Developed mild stump sepsis and developed dyspnoea
18	15 January 2019	Echocardiography showed severe aortic valve regurgitation
24	21 January 2019	Two blood cultured from a single venepuncture cultured <i>Streptococcus mitis</i> and the patient received 6 weeks of penicillin G prior to valve replacement surgery
71	28 February 2019	Aortic valve replacement was completed, and heart valvular tissue was sent for microbiological and histological testing
75	4 March 2019	<i>Corynebacterium jeikeium</i> was cultured from heart valve tissue and was only susceptible to vancomycin. Histology was also in keeping with endocarditis
118	16 April 2019	Patient completed 6 weeks of post-operative vancomycin and made a full recovery
284	2 October 2019	Patient was followed up three times at the cardiology clinic postoperatively and remained clinically stable, with no clinical sequelae and no re-operation was required

Case presentation

A 50-year-old male, with well-controlled hypertension on hydrochlorothiazide 12.5 mg tablets daily and a 20-year pack-year smoking history, presented to a secondary health care facility with a 1-month history of mild dyspnoea and septic lesions to his left lower limb. A diagnosis of left leg peripheral vascular disease was made, with critical limb ischaemia and secondary cellulitis. The cardiovascular examination was normal, with no clinical features suggestive of IE.

A left above knee amputation was done due to the poor prognosis of the patients' disease and to attain source control of the infection. Two weeks following the initial amputation, the patient developed stump sepsis, which was empirically treated with piperacillin/tazobactam 4.5 mg intravenous (IVI) 8 hourly. A subsequent cardiac screen was performed, because of the thromboembolic risk in this patient and an early diastolic murmur was noted on auscultation. Transthoracic echocardiography (echo) showed a fixed vegetation on the patient's aortic valve with severe aortic regurgitation (Figure 1). Additional echo findings demonstrated preserved systolic and diastolic function, a normal-sized aortic root and mild mitral regurgitation (not for surgical intervention). His coronary arteries were unobstructed on coronary angiogram.

Two blood cultures obtained from a single antecubital fossa venipuncture revealed a *Streptococcus mitis* group (*mitis*), susceptible to penicillin with a minimum inhibitory concentration (MIC) of

Mechanical Valve) via an upper mini-sternotomy aided by cardiopulmonary bypass. Features suggestive of active endocarditis intra-operatively included an aortic valve vegetation with surrounding inflammation.

Intra-operative aortic valve specimens were sent for histological and microbiological confirmation. After 24-h incubation in cooked meat medium broth followed by 24-h subculture onto tryptose blood and chocolate agar, there were characteristic bacterial colonies noted on both agar plates (Figure 2). *Corynebacterium jeikeium* was subsequently confirmed with the Vitek Mass Spectrometry system (bioMérieux, Inc., Durham, NC, USA).

The *C. jeikeium* cultured was resistant to penicillin but susceptible to vancomycin with an MIC of 0.5 µg/mL. The histology of the aortic valve tissue confirmed granulomatous inflammation in keeping with active endocarditis. The patient completed 6 weeks of post-operative IVI vancomycin (1000 mg 12 hourly) therapy and made a full recovery. The patient was followed up postoperatively and remained clinically stable, with no clinical sequelae and no re-operation was required.

Discussion

This is to the author's best knowledge the first case of microbiological and histological confirmation of native valve *C. jeikeium* IE from heart

valve tissue, fulfilling the pathological criteria of the Modified Duke diagnostic scheme.

Corynebacteria are small club-shaped Gram-positive bacilli and frequently colonizes the skin.^{3,4} It has a propensity for opportunistic infection in immunocompromised individuals with indwelling and prosthetic devices, which forms a nidus for infection.^{3,4} *Corynebacterium* IE has a predilection for left-sided heart valve involvement, most commonly involving the aortic valve and affecting adult males in over 70% of cases.^{3,4,8}

Corynebacterium jeikeium was previously known as CDC group JK and since its recognition in 1976 as a distinct species,⁹ <40 cases of *C.*

jeikeium IE have been described.^{3,10–12} Approximately 65–74% of *C. jeikeium* IE cases described in the literature were from prosthetic valve IE.³ Previously described native valve IE cases of *C. jeikeium* are rare and the diagnoses were confirmed from blood cultures only, which is in contrast to our case study with *C. jeikeium* confirmed on aortic heart valve tissue.^{3,10–13} It is interesting to note that in our case no blood culture isolates cultured *C. jeikeium*, but this might be explained by the slow growth rate of *Corynebacterium* species, the possibility of overgrowth of *S. mitis* in the two positive blood culture isolates, the timing of the blood culture draws and the possibility of broad spectrum antibiotics suppressing the growth of the *C. jeikeium*. *Corynebacterium jeikeium* has a high infection-related mortality of ~30%; as it is typically multidrug-resistant and can form biofilms.^{3,4} Persistence of *C. jeikeium* IE has been described and often requires multiple courses of vancomycin and recurrent heart valve replacements.¹⁴ The patient in the case described had successful clearance of *C. jeikeium* following an aortic valve replacement combined with 6 weeks of antibiotic therapy with vancomycin.

In our case, there is the possibility that the patient had mixed infection IE with *S. mitis* and *C. jeikeium*. According to the Modified Duke diagnostic criteria, the two blood cultures with *S. mitis* and initial transthoracic echocardiography findings did not fulfil the diagnostic criteria for IE.⁵ The subsequent treatment with penicillin G IVI could have selected for the *C. jeikeium*, as it was resistant to penicillin. Histological and microbiological diagnosis from the aortic valve tissue confirmed IE with *C. jeikeium*, as it fulfilled the Modified Duke IE pathological criteria.

The prevalence of *C. jeikeium* IE might be underestimated due to corynebacteria often deemed to be skin contaminants.³ Previous studies have shown that cultures from heart valves have a specificity of above 70%, with false positives predominantly arising due to contamination.¹⁵ Contamination of heart valve tissue can occur before or during the culturing process in up to 17% of cultures.¹⁵ In this case, the probability of *C. jeikeium* being a pathogen was likely, as no intra-laboratory contamination was suspected and after completing pre-operative treatment with penicillin G the histological findings on the heart valves were suggestive of active endocarditis. The left leg



Figure 1 Transthoracic echocardiography showing a large vegetation on the left coronary cusp of the aortic valve in five-chamber view (A) and parasternal view (B).

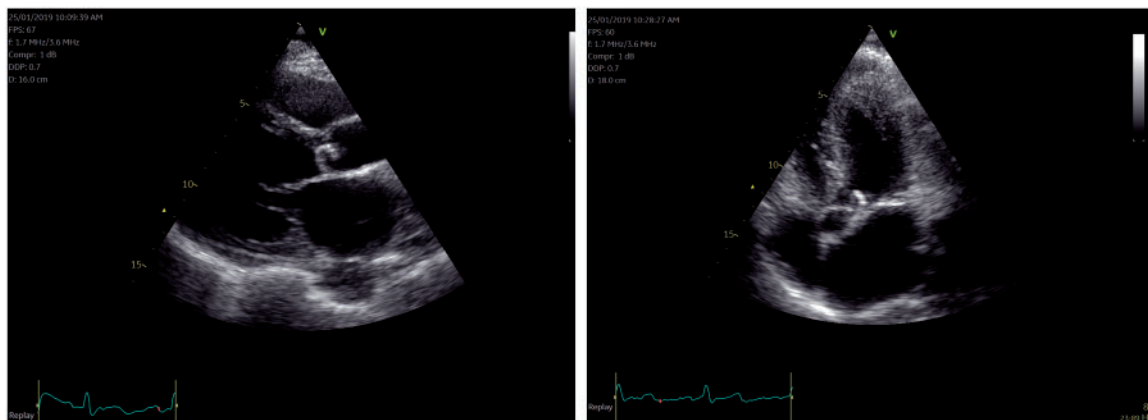


Figure 2 Grey/white non-haemolytic colonies of *Corynebacterium jeikeium* on blood agar, following subculture from cooked meat medium broth.

stump sepsis could have served as the inoculation site of the *C. jeikeium* into the bloodstream. The culturing of *C. jeikeium* directly from heart valve tissue was most likely confirmatory and afforded the patient the correct directed-antimicrobial therapy and subsequent full recovery.

This case highlights the complexities of culturing bacteria from heart valve tissue and the importance in fulfilling the Modified Duke diagnostic criteria to ensure that the correct causative organism is identified, and that appropriate antibiotic therapy is afforded to the patient with IE. Even though *Corynebacterium* species is a rare cause of IE, clinicians should remain cognizant that *C. jeikeium* is typically multidrug-resistant and that standard empiric IE therapy may not cover this bacterium in cases of prosthetic and native valve IE.

Lead author biography



Wentzel Bruce Dowling completed his MB, ChB in 2011 and is currently a registrar completing his fellowship in Medical Microbiology at Stellenbosch University, Tygerberg Hospital, Cape Town, South Africa. His research interests include infectious diseases associated with heart disease, *Mycobacterium tuberculosis* diagnostics, and laboratory test optimization.

Supplementary material

[Supplementary material](#) is available at *European Heart Journal - Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s)

and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

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