CASE REPORT

Helcococcus kunzii prosthetic valve endocarditis secondary to lower extremity cellulitisSaira Farid,¹ William Miranda,² Joseph Maleszewski,³ Muhammad Rizwan Sohail¹¹Infectious Diseases, Mayo Clinic, Rochester, Minnesota, USA²Cardiovascular Diseases, Mayo Clinic, Rochester, Minnesota, USA³Laboratory Medicine and Pathology, Mayo Clinic, Rochester, Minnesota, USA

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SUMMARY

An 88-year-old man with history of bioprosthetic aortic valve replacement was hospitalised with fever, chills, malaise and right lower extremity cellulitis. Laboratory investigations revealed leucocytosis and blood cultures grew *Helcococcus kunzii*. Although transoesophageal echocardiography was negative for endocarditis, the patient was treated with 4 weeks of intravenous ceftriaxone. However, he was readmitted 6 weeks later with symptoms of fever, chills and hypoxia in setting of recurrent *H. kunzii* bacteraemia. A repeat transoesophageal echocardiogram revealed a mobile mass on bioprosthetic aortic valve, severe perivalvular insufficiency with pseudoaneurysm formation, and severe native mitral and tricuspid valve regurgitation. Cardiothoracic surgery was consulted and the patient underwent replacement of aortic valve and aortic root, and tricuspid and mitral valve repairs. Histological examination of excised bioprosthetic aortic valve revealed active endocarditis with cocci identified on silver stain. Patient was successfully treated with 4-week course of intravenous ceftriaxone and was doing well at 2-year follow-up.

BACKGROUND

Helcococcus kunzii is a Gram-positive facultative anaerobe that was first described in 1993 by Collins *et al*¹ as part of the normal skin flora and has since been reported to cause a diverse variety of infections in different organs and prosthetic implants. The limited microbiological testing for this organism and the growing antibiotic resistance found in recent studies makes it extremely important to bring this organism into the limelight. Increased awareness and simplified testing modalities are needed to identify this slow-growing organism as possible cause of complicated prosthesis-related infections. We report the first case of prosthetic valve endocarditis caused by *H. kunzii*.

CASE PRESENTATION

An 88-year-old man presented to an Urgent Care Centre with complaints of fever, chills and malaise and was noted to have right lower extremity cellulitis. His past medical history was significant for hypertension, hyperlipidaemia, coronary artery disease, diastolic heart failure, paroxysmal atrial fibrillation, chronic obstructive pulmonary disease, bilateral knee arthroplasty, chronic kidney disease and obstructive sleep apnoea. He had undergone coronary artery bypass grafting and bioprosthetic

aortic valve replacement for severe aortic stenosis 3 years prior to current presentation. On examination, patient had erythema, warmth and induration of right leg, consistent with cellulitis. Cardiovascular examination revealed no new murmur and there were no peripheral stigmata of endocarditis.

INVESTIGATIONS

Laboratory investigations on admission revealed white count of $19.1 \times 10^9/L$ and elevated liver enzymes including aspartate aminotransferase (AST) of 221 U/L, alanine aminotransferase (ALT) of 282 U/L and alkaline phosphatase of 334 U/L. His creatinine was raised at 3.2 mg/L from a baseline of 2.4 mg/L and his C-reactive protein (CRP) was 25.5 mg/L. One of the two sets of blood cultures drawn on admission grew fastidious gamma-haemolytic streptococci. The organism was then plated on blood agar plate and identified as *H. kunzii* by leucine amino peptidase and pyrrolidonyl arylamidase test. Matrix-assisted laser desorption/ionisation time of flight (MALDI-TOF) mass spectrometry was then used to confirm the organism as *H. kunzii*. Transoesophageal echocardiogram (TEE) was performed. The bioprosthetic aortic valve was poorly visualised but no concerning findings suggestive of infective endocarditis were visualised on echocardiography. Nonetheless, patient was treated with 4 weeks of intravenous ceftriaxone due to presence of prosthetic valve and concern for seeding. Repeat blood cultures prior to discharge from hospital and after completing the 4-week antibiotic course were negative. However, 3 weeks after completing the antibiotic course, the patient was readmitted with symptoms of fever, chills and worsening hypoxia. Chest radiography was consistent with pulmonary oedema secondary to heart failure. *H. kunzii* grew in both sets of blood cultures drawn on admission. Antimicrobial susceptibility testing on the isolate from the first admission, performed using the Epsilometer test by BioMérieux, revealed that the organism was susceptible to penicillin, ceftriaxone and vancomycin, and the minimum inhibitory concentration (MIC) of ceftriaxone was 0.5 mcg/mL for *H. kunzii*. The patient was re-started on intravenous ceftriaxone. A repeat TEE showed a mobile mass attached to bioprosthetic aortic valve, perivalvular insufficiency with pseudoaneurysm formation, and severe native mitral and tricuspid valve regurgitation (figure 1). These echocardiographic findings along with *H. kunzii* bacteraemia were consistent with definite prosthetic valve endocarditis based on the modified Duke criteria.

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Figure 1 Two-dimensional transoesophageal echocardiography, mid-oesophageal view (A) shows a pseudoaneurysm of the posterior aortic root (asterisk) and small mobile structure compatible with vegetation (arrow). Colour-flow Doppler (B) shows flow into the pseudoaneurysm. Ao, aorta; LA, left atrium; LV, left ventricle.

TREATMENT

Cardiothoracic surgery was consulted due to the presence of aortic root abscess and pseudoaneurysm formation in the setting of prosthetic valve endocarditis. Patient underwent redo valve surgery with reconstruction of mitral–aortic continuity with bovine pericardium, aortic root replacement with valve conduit, mitral valve and tricuspid valve repairs and redo coronary bypass. The biopsy of the excised bioprosthetic aortic valve showed active endocarditis, and cocci were identified on Grocott's methenamine silver stain (figure 2). Valve cultures were negative, likely due to preoperative antibiotic administration.

OUTCOME AND FOLLOW-UP

The postoperative course was complicated by acute kidney injury, heart failure and multiple episodes of ventricular tachycardia which were all medically managed. Patient was discharged home in a stable condition to complete 4-week course of intravenous ceftriaxone. He was doing well at the last follow-up visit.

DISCUSSION

H. kunzii was first reported in 1993 by Collins *et al.*¹ It is a facultative anaerobe that is Gram-positive, non-motile and catalase negative. Four different strains of genus *Helcococcus* have

been reported since then and these are *H. ovis* (1999),² *H. suecicensis* (2004),³ and *H. seattlensis* (2014)⁴ and *H. pyogenes*.⁵ The identification of *Helcococcus* species remains challenging due to the slow growth of the organism and the inadequate databases for commercially available kits.⁴ All strains of *Helcococcus* grow well after a 48-hour incubation at 35°C in air enriched with 6% to 7% CO₂ on 5% horse blood agar.^{4,6} Additionally, the 16S rRNA gene sequencing can be used to confirm the species-level identification by MALDI-TOF mass spectrometry.⁶

H. kunzii was initially described as part of the normal skin flora and was thought to be an opportunistic pathogen. Subsequently, it was identified as the cause of lower extremity wound infections in patients with diabetic foot ulcers,^{1,4,7} and skin and soft tissue infections in immunocompetent individuals.^{1,8} In a study done over a 6-year period, *H. kunzii* isolates were recovered from four healthcare facilities and majority of these (79%) were from diabetic foot ulcers.⁶ Other reported cases include osteomyelitis and superficial and deep abscesses,⁹ prosthetic joint infections,⁵ endocarditis,¹⁰ plantar phlegmon, implantable cardiac device infection,¹¹ breast¹² and cerebral abscesses.¹³

There is only one published case of endocarditis due to *H. kunzii*. This was in a 79-year-old man who presented with *H. kunzii* native mitral valve endocarditis.¹⁰ This patient had a history of severe peripheral arterial disease and ischaemic heart disease treated by coronary angioplasty, left and right carotid surgery by endarterectomy, and an abdominal aortic aneurysm requiring vascular stenting. He presented to the emergency room with fever, chills and pulmonary oedema. TEE revealed a rather larger (28.6 mm) mitral valve vegetation and severe mitral valve dysfunction. MRI of spine and brain showed no evidence of metastatic seeding. Four out of six blood culture bottles were positive for *H. kunzii*. MALDI-TOF mass spectrometry and 16S rDNA sequencing were used for the identification of *H. kunzii*. Antimicrobial susceptibility testing revealed that organism was fully susceptible to penicillin, amoxicillin, cefotaxime and vancomycin. The patient underwent mitral valve replacement followed by intravenous amoxicillin therapy for 4 weeks. The origin of *H. kunzii* bacteraemia in this case was thought to be either a central venous catheter or lower extremity ulcers.

A case of *H. kunzii* infection in a patient living with an implantable cardiac device was reported by McNicolas *et al.*¹¹ This was a 75-year-old male presenting with swelling and yellowish discharge from the device generator site, 8 months after the insertion of his cardiac device. Examination revealed a small abscess overlying the device without evidence of cellulitis. He was started on flucloxacillin and benzylpenicillin but

Figure 2 Pathology of explanted bioprosthetic valve. (A) Gross examination of the inflow surface shows a shallow surface thrombus (white arrowhead). (B) Photomicrograph of the bioprosthetic valve leaflet shows the surface thrombus (asterisk) adherent to the leaflet (arrowed line) (H&E; original magnification, x40). (C) Grocott's methenamine silver stain highlights numerous degenerating cocci within the fibrin thrombus (original magnification, x600).

developed a progressive cellulitis despite empiric antibiotic initiation. The superficial abscess was drained and the device was left in place as the ultrasound of the area and the TEE showed no evidence of endocarditis. Gram stain of the swab obtained from purulent drainage showed Gram-positive cocci and culture was positive for *H. kunzii* at 48 hours. Once antibiotic susceptibilities were available, the patient was discharged on oral amoxicillin and rifampicin for a period of 4 weeks, with complete resolution of the infection.

The antimicrobial susceptibility testing of *H. kunzii* has been reported by several investigators and the organism is mostly susceptible to beta-lactam agents, as was the case in our patient.^{12–14} However, resistance to other classes of antimicrobial agents, particularly to trimethoprim-sulfamethoxazole, azithromycin, clindamycin,⁷ moxifloxacin, levofloxacin, erythromycin¹⁵ and aminoglycoside resistance^{4 10 12} has been reported.

Our patient received intravenous ceftriaxone therapy for 4 weeks following the initial presentation with right leg cellulitis and concern for valve seeding despite negative echocardiogram. He had resolution of the cellulitis and had negative blood cultures following antibiotic initiation. However, the patient subsequently had relapse of *H. kunzii* bacteraemia complicated by perivalvular extension of the infection. He

was successfully treated with combined medical and surgical approach.

Contributors All authors have contributed significantly to manuscript drafting, revision and discussion. JM reviewed the histopathology specimens and WM interpreted the transoesophageal echocardiogram images.

Competing interests None declared.

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Learning points

- *Helcococcus kunzii* is an emerging pathogen responsible for skin and soft tissue infections, osteomyelitis and deep organ infections.
- Cardiovascular infections (endocarditis, vascular graft infection, cardiac device infection) are rare complications of *H. kunzii* bacteraemia.
- Antimicrobial susceptibility testing should be performed in all cases as high-level resistance to trimethoprim-sulfamethoxazole, macrolides, clindamycin, fluoroquinolones and aminoglycosides has been reported.
- A combined medical and surgical approach should be considered for complicated cases of prosthetic valve endocarditis due to *H. kunzii*.

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