Case Report

Late-onset native valve endocarditis caused by Corynebacterium kroppenstedtii

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\section*{Article Info}

\textbf{Article history:}
Received 13 August 2020
Received in revised form 2 September 2020
Accepted 11 September 2020

\section*{Abstract}

Corynebacterium kroppenstedtii is an emerging cause of granulomatous mastitis and recurrent breast abscesses in women, but data on its clinical relevance in nongynecological disease conditions are limited. Here, we report the first case of a late-onset endocarditis of a native aortic valve in a 73-year-old male patient who presented with symptomatic aortic insufficiency. Echocardiography and cardiac computed tomography revealed the perforation of the noncoronary cusp and a large perivalvular abscess cavity. Hence, the surgical replacement of the aortic valve and aortic root were performed. Intraoperatively obtained tissue specimens grew \textit{C. kroppenstedtii} and the patient made a full recovery after a 6-week course of antibiotic treatment. We briefly review the literature pertaining to antimicrobial susceptibility patterns of \textit{C. kroppenstedtii} and available treatment recommendations. Our report calls for further studies to assess the role of this bacterium as a causative agent of infections other than granulomatous mastitis.

\section*{Introduction}

Corynebacteria comprise a heterogeneous group of gram-positive, aerobic, rod-shaped bacteria, which have a characteristic curved, palisade-like morphology on microscopy. While some species such as \textit{Corynebacterium diphtheriae}, the causative agent of diphtheria, are of high clinical significance, many other \textit{Corynebacterium} spp. are mere colonizers of the human body. Hence, it is a major challenge to judge the actual relevance of these bacteria when they are detected in clinical specimens. \textit{Corynebacterium kroppenstedtii} was first described in the late 1990s, and was subsequently recognized as an emerging pathogen of cystic neutrophilic granulomatous mastitis and breast abscesses in women (Bernard et al., 2002; Paviour et al., 2002; Riegel et al., 2004; Le Flèche-Matéos et al., 2012; Dobinson et al., 2015). However, infections at other body sites are rare, and only a single case of early prosthetic valve endocarditis due to \textit{C. kroppenstedtii} was reported thus far (Hagemann et al., 2015). Here, we describe the first case of late-onset infective endocarditis of a native valve caused by this bacterium, and briefly review the available literature.

\section*{Case report}

A 73-year-old male patient was referred to our hospital in Germany for severe and symptomatic aortic insufficiency. Two years ago, the patient had undergone valve-sparing aortic root replacement for aortic valve insufficiency and root dilatation. At presentation, the patient was afibrile and blood parameters were not suggestive of an acute infection (no leukocytosis and normal C-reactive protein). However, the patient had a severe, symptomatic aortic regurgitation, and echocardiography on admission showed chronic aortic insufficiency with changes suggestive of endocarditis, i.e., perforation of the noncoronary cusp and a large perivalvular abscess cavity (Figure 1), which was also seen on cardiac computed tomography (Figure 2). Hence, repeated surgery was performed.

After connection to the cardiopulmonary bypass and under cardioplegic arrest, we found a perforation of the noncoronary cusp and a large chronic cavity in the aortomtal continuity. The aortic valve and root were replaced with a stentless bioprosthesis. The postoperative course was unremarkable.

As no pathogen had been detected in blood cultures sampled before surgery, an empirical antibiotic treatment regimen with daptomycin and ampicillin-sulbactam was started. In total, six samples of surgically removed cardiac tissue were sent for microbiological diagnostics. The tissue specimens were homogenized and independently subjected to the following diagnostics: (i)
Corynebacteria are rare pathogens of endocarditis (Brouqui and Raoult, 2001; Belmares et al., 2007). In recent years, some cases of endocarditis due to corynebacteria have been reported (Belmares et al., 2007; Hagemann et al., 2015), mainly in patients with early-onset prosthetic valve endocarditis (Belmares et al., 2007; Hagemann et al., 2015). While nontoxigenic C. diphtheriae is the most frequently isolated Corynebacterium species from heart valves (Belmares et al., 2007), C. kroppenstedtii has been reported only once in a German patient with prosthetic valve endocarditis (Hagemann et al., 2015). In our case, C. kroppenstedtii was isolated from a native aortic valve. Interestingly, our patient had previously undergone partial prosthetic replacement of the aortic root and aortic arch, which might have augmented the risk of later infection due to the known ability of certain bacteria to attach to nonnative vascular surfaces (Knox and Holmes, 2002; Belmares et al., 2007).

C. kroppenstedtii was described for the first time in 1998 by Collins and colleagues (Collins et al., 1988) in a sputum sample of an 82-year-old female patient with lung disease. Besides the lack of mycolic acids (Collins et al., 1988), one distinguishing characteristic of C. kroppenstedtii is its lipophilism, which is partially responsible for the difficulty to grow the bacterium on microbiological standard culture (e.g., sputic soy agar) (Riegel et al., 2004).

Thus far, C. kroppenstedtii has almost exclusively been described in association with cystic neutrophilic granulomatous mastitis and breast abscesses (Bernard et al., 2002; Paviour et al., 2002; Riegel et al., 2004; Le Flèche-Matéos et al., 2012; Dobinson et al., 2015), whereas only five case reports from nongynecological compartments have been reported in the literature, i.e., two sputum samples (Collins et al., 1988; Bernard et al., 2002), one isolate each in a blood culture and a lung biopsy from Canada (Bernard et al., 2002), and the aforementioned prosthetic valve endocarditis in a German patient (Hagemann et al., 2015).

International guidelines do not provide distinct treatment recommendations for endocarditis caused by corynebacteria, and there are only a few studies on antimicrobial susceptibility patterns of C. kroppenstedtii. Resistance to clindamycin is rare and only single cases have been reported (Fernández-Natal et al., 2016). Of note, C. kroppenstedtii usually remains susceptible to most other antibiotic classes (Riegel et al., 2004; Le Flèche-Matéos et al., 2012; Hagemann et al., 2015). However, researchers from New Zealand recently observed an increasing resistance to beta-lactam antibiotics (Dobinson et al., 2015).
In conclusion, we report a case of endocarditis due to Corynebacterium kroppenstedtii, an emerging pathogen that is difficult to grow in culture and for which recommendations on appropriate antimicrobial treatment have not yet been established. Our report calls for further studies to assess the role of **C. kroppenstedtii** as a causative agent of infections other than granulomatous mastitis.

**Funding**

No specific funding was received for this work.

**Transparency declarations**

All authors have nothing to disclose.

**Acknowledgments**

We acknowledge support by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) and Saarland University within the funding programme Open Access Publishing. Written informed consent was obtained from the patient to publish this case report.

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