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Recurrent *Klebsiella pneumoniae* Infection Causing Transcatheter Aortic Valve Implantation (TAVI)-Related Endocarditis

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ABSTRACT

The authors report the case of an 86-year-old woman presenting with recurrent *Klebsiella pneumoniae* bacteraemia. She had severe aortic stenosis submitted to a recent transcatheter aortic valve implantation (TAVI). Initially, *Klebsiella pneumoniae* bacteraemia from a urinary source was diagnosed . Following another 4 episodes of bacteraemia with the same agent, the source was ultimately found to be a periprosthetic abscess. Considering the patient's unsuitability for surgery, a decision was made for life-long antimicrobial therapy. This approach has been successful in preventing recurrences or complications. Endocarditis is one of the most severe complications seen following TAVI, often carrying a poor prognosis. Even though *Klebsiella* spp. are common pathogens for healthcare-associated infections among the elderly, they are seldom the causative agent for endocarditis. Being the first reported case of TAVI-related *Klebsiella* endocarditis, it was successfully managed using a medical approach.

LEARNING POINTS

- Non-HACEK Gram-negative bacilli are organisms infrequently found to cause infective endocarditis (IE). This is the first reported case of transcatheter aortic valve implantation (TAVI)-related *Klebsiella* IE.
- Diagnosing an infectious complication associated with procedural or prosthetic material is not always straightforward; a high level of suspicion and a systematic approach are essential.
- Most cases of TAVI-related IE are ineligible for surgery due to a prohibitive procedural risk. Long-term antibiotic therapy may be a suitable alternative for patients with uncontrolled infection considered unfit for surgery.

KEYWORDS

Transcatheter aortic valve implantation; infective endocarditis; *Klebsiella pneumoniae*; bacteraemia.

INTRODUCTION

Klebsiella pneumoniae is a ubiquitous Gram-negative bacterium, commonly responsible for urinary tract infections (UTIs), but also pneumonia, intra-abdominal infection or healthcare-related vascular catheter and surgical wound infections. *Klebsiella pneumoniae*, as for other non-HACEK Gram-negative bacilli, is not a typical agent associated with infective endocarditis (IE), especially with late-onset prosthetic valve endocarditis.

It is estimated that the rate of recurrence of infection by these agents could rise up to 15%, depending on bacterial genus, antibiotic resistances and individual risk factors. Due to worldwide population aging and increasing carriage of chronic invasive medical devices, the risk for such infectious complications is dramatically increasing.

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Transcatheter aortic valve implantation (TAVI) has been a growing reality for the last 2 decades. Patients suffering from severe aortic stenosis, who are ineligible for cardiac surgery due to a prohibitive surgical risk, especially the elderly, are those who have been benefiting the most from these procedures.

Post-procedural complications could differ following TAVI or standard aortic valve replacement (SAVR) but, according to the literature available thus far, the risk of IE in TAVI seems to be comparable to that seen with SAVR[1]. The expectation that a less invasive procedure such as TAVI could be associated with a lower rate of an infective complication such as IE has not been supported. Indeed, TAVI-related endocarditis may well increase the incidence of IE, as the procedure has been found to be occasionally complicated with aortic abscess (in 15.1% of cases) or persistent infection (in 28.3%) [2]. Possible risk factors for IE might comprise the specific population, orotracheal intubation and the type of endovascular valve, but further studies are needed to clarify this association.

Experience with TAVI-related infections remains limited and the current guidelines do not include any specific provisions for these concerning definite diagnosis or treatment. Frequently, in patients with post-TAVI IE, medical therapy seems to be the only reasonable treatment, due to the very high surgical risk associated with this specific population and the technical challenge of the surgical procedure itself. Furthermore, eradication could be quite difficult, depending on the microorganism and its antibiotic sensitivity. These conditions carry an elevated mortality rate[2, 3].

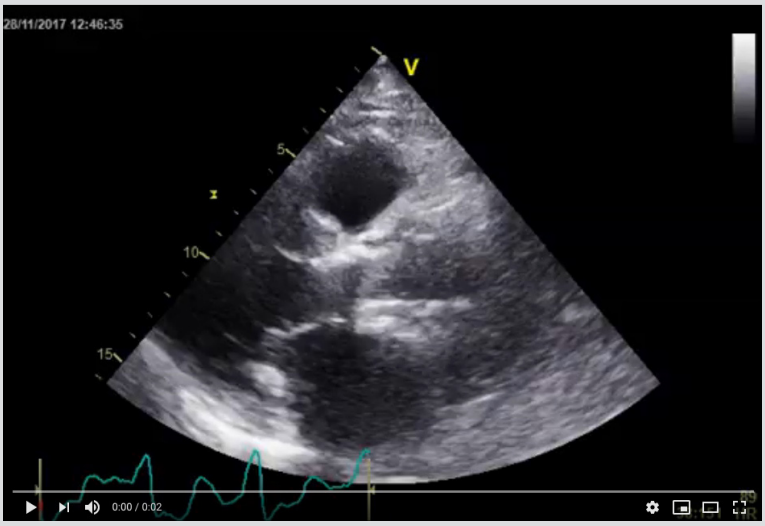
Herein, the authors present the first case of TAVI-related Klebsiella pneumoniae IE in a patient suffering from recurrent urinary-source bacteraemia.

CASE DESCRIPTION

The authors present the case of an 86-year-old woman, with type 2 diabetes mellitus and symptomatic severe aortic stenosis, who was submitted to TAVI, according to a Heart Team decision.

Two weeks later, the patient presented with the first of a series of repeated episodes of fever, malaise and unspecific symptoms related to recurrent *Klebsiella pneumoniae* bacteraemia. The susceptibility profile revealed sensitivity to all beta-lactams and gentamicin. Due to left hydronephrosis observed in an abdominal computed tomography (CT) scan, a UTI was considered. The patient was treated with 12-day ceftriaxone and 7-day metronidazole courses. After successful resolution of this first episode, Klebsiella pneumoniae bacteraemia (with the aforementioned antibiotic susceptibility spectrum) relapsed 4 more times in 6 months, with no source being apparent.

These multiple recurrences suggested an insidious, non-controlled focus of infection responsible for bacteraemia, which was not being tackled in a sustained manner with medical therapy. Abdominal ultrasound, a full body CT scan and total colonoscopy ruled out alternative infective foci. Beyond blood culture, other biological fluids were sterile in terms of microbial assessment. Inflammatory markers were elevated. Positron emission tomography (PET) and 111In-leucocyte scintigraphy showed no sign of active infection. In order to exclude early post-TAVI IE, our main diagnostic suspicion, trans-oesophageal echocardiography (TOE or TEE) was performed, showing a mild posterior valvular leak and an echolucent periprosthetic zone. According to the assessment of several echocardiographers, this could be related to a periprosthetic abscess (*Video 1*).



Video 1. Trans-oesophageal echocardiography showing a mild posterior valvular leak and an echolucent periprosthetic zone
Watch the video: https://youtu.be/j1PmzG8_9cw

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Given that we always isolated *Klebsiella pneumoniae*, with the same antibiotic susceptibility spectrum, antibiotic courses were based on the susceptibility profile of this microorganism. A decision was made for life-long antibiotic treatment and we chose oral cefuroxime. The patient kept follow-up appointments, and after over 2 years on this regimen, she remains free from active infection or complications.

DISCUSSION

Diagnosing an infectious complication associated with procedural or prosthetic valvular material is not always straightforward. Considering there are no specific guidelines for the diagnosis or treatment of infectious complications after TAVI, a reasonable approach would be to apply a similar practice as for SAVR, but such reasoning lacks definitive evidence.

The Duke criteria for IE seem to be the most accurate way of diagnosing this complication in patients who have undergone TAVI, while specific criteria and definitions have yet to be established. In our case, positive blood cultures, a predisposing condition and fever were present, making post-TAVI IE a possible diagnosis.

Classically, non-HACEK Gram-negative microorganisms are seldom responsible for either native or prosthetic valve endocarditis, *Klebsiella* species being extremely rare[4]. The evidence available on the microbiological profile of TAVI-related IE suggests staphylococci and enterococci are most frequently responsible[2, 3]. To the best of our knowledge, this is the first-ever reported case of TAVI-related endocarditis caused by *Klebsiella* spp. We presume that this organism entered the bloodstream in the setting of a UTI and then embedded itself in the periprosthetic valvular tissue.

TAVI-related endocarditis occurs with an incidence of 0.3–1.2% per patient-year, rates that are comparable with those of SAVR-related endocarditis[5]. In-hospital mortality ranges from 36 to 47% while 2-year mortality is above 60% [2, 3]. While guidelines on the management of IE recommend surgical treatment when certain complications are present, this approach has not been followed in practice, according to data from major cohorts[2,3]. This difference is likely due to the high and prohibitive surgical risk with TAVI patients, many of whom underwent TAVI due to not being suitable candidates for SAVR. Furthermore, the technical challenge of removing a stent frame adherent to the aorta may weigh on the decision not to intervene.

Likewise, our patient was considered to have an unacceptable surgical risk and was hence managed in a strictly medical fashion. The recurrences of bacteraemia suggested an uncontrolled infection focus, probably related to the prosthetic valve material. This was, however, ultimately managed with long-term antimicrobial therapy, a last-resort solution that has proved successful so far.

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