Case report

Mitral endocarditis caused by Achromobacter xylosoxidans in an older patient: Case report and literature review

Joseph Kengni Tameze\textsuperscript{a,}*, Kéziah Korpak\textsuperscript{a,b}, Michèle Compagnie\textsuperscript{a}, Henrianne Levie\textsuperscript{a}, Soraya Cherifi\textsuperscript{c}, Salah Eddine Lali\textsuperscript{d}

\textsuperscript{a}Department of Geriatric Medicine, CHU de Charleroi, Université libre de Bruxelles (ULB), Charleroi, Belgium
\textsuperscript{b}Laboratory of Experimental Medicine (ULB 222 Unit), Medicine Faculty, Université libre de Bruxelles (ULB), ISPPC CHU de Charleroi, Belgium
\textsuperscript{c}Department of Infectious Disease Department, CHU de Charleroi, Université libre de Bruxelles (ULB), Montigny-le-Tilleul, Belgium
\textsuperscript{d}Clinical Biology Department, CHU de Charleroi, Belgium

**A B S T R A C T**

We report a rare case of recurrent *Achromobacter xylosoxidans* bacteremia in an older woman in 2014 and 2020. During the more recent bacteremia, a diagnosis of mitral endocarditis was made. The patient could not have surgery because of severe comorbidities and a high operative risk. Combined antibiotic therapy was given with piperacillin/tazobactam and trimethoprim/sulfamethoxazole (TMP/SMX). Antibiotic therapy was administered for six weeks with a good response, but the patient relapsed after six days with *A. xylosoxidans* bacteremia and cardiac decompensation. Antibiotic therapy was resumed, using meropenem and TMP/SMX, but the patient died one month after the recurrence. We review the 22 cases of *A. xylosoxidans* endocarditis that have been described in the literature.

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**Introduction**

*Achromobacter xylosoxidans* (*A. xylosoxidans*) is a Gram-negative aerobic bacterium that was first described in 1971 by Yabuchi and Oyama [1] in purulent secretions from seven patients with chronic otitis media. The pathogen has since been identified as being responsible for cases of meningitis, pneumonia, central catheter infection, sepsis, mediastinitis, and pharyngitis [2,3], but has rarely been associated with endocarditis. Infections occur more frequently in immunodeficient patients with neoplasia or in frail older patients. The patient described here was an 81-year-old woman with *A. xylosoxidans* bacteremia and secondary native mitral valve endocarditis.

**Case presentation**

An 81-year-old woman was admitted to Charleroi University Hospital. Her medical history included acute rheumatic fever at a young age. In 2014, she had spent three weeks in another hospital for chronic varicose ulcers that were superinfected with *Pseudomonas aeruginosa* and *Staphylococcus aureus*. During that stay, blood cultures performed following a febrile episode had grown *A. xylosoxidans*. The patient had experienced several complications, including global cardiac decompensation with atrial fibrillation (AF) requiring anticoagulation with a vitamin K antagonist. Transthoracic echocardiography (TTE) during that admission showed normal left ventricular function, mild mitral insufficiency with a rheumatic valve, tricuspid insufficiency with pulmonary hypertension, severe right ventricular dilatation, and no vegetations. No transesophageal echocardiography (TEE) was performed. The patient responded well to antibiotics and was discharged home.

In January 2020, the patient was admitted to our institution from a nursing home where she had been a resident for one year. She was confused, with significant functional decline that had been getting worse over the previous five days. The patient was hypothermic with a temperature of 35.7 °C and rigors, a low blood pressure of 80/50 mmHg, and a heart rate of 97 bpm. She had a systolic murmur of 2/6 at the mitral and aortic orifices and significant lymphatic edema of the lower legs, with erythrocytosis but no ulceration. The patient had just completed a 14-day course of amoxicillin/clavulanic acid 875 mg 3 times per day for erysipelas of the lower limbs.

Laboratory results showed a significant inflammatory syndrome with C-reactive protein (CRP) at 221 mg/dl, cholestasis, moderate renal failure, and a partial thromboplastin time of 5% (INR 10). A brain CT scan showed cortical atrophy with no other...
abnormalities. There were no suspicious lesions, embolism, or pulmonary focus of infection on the chest-abdominal CT scan. Urine culture was negative. The patient was prescribed empirical antibiotic therapy with amoxicillin/clavulanic acid at a dose of 1 g 4 times per day.

Two days later, the results of the blood cultures taken on admission revealed A. xylos oxidans. The antibiogram (Table 1) showed susceptibility to piperacillin/tazobactam, ceftazidime, trimethoprim/sulfamethoxazole (TMP/SMX), and resistance to amoxicillin/clavulanic acid and cefotaxime. Antibiotic therapy was therefore changed to piperacillin/tazobactam, at a dose of 4 g 3 times per day because of the patient’s renal insufficiency. The patient improved clinically and biologically, with progressive resolution of the inflammatory syndrome.

On the 9th day post-admission, blood cultures were repeated following a febrile episode. A diagnosis of endocarditis was suspected. TEE showed moderate mitral disease and aortic stenosis with signs of volemic overload but no vegetations. A TEE was performed, which revealed a 12 mm vegetation at the level of the posterior mitral valve, and one minor criterion (a persistent positive blood cultures and oscillating intracardiac vegetations on the posterior mitral valve), and one minor criterion (a rheumatic mitral valve with moderate insufficiency).

To our knowledge, only 22 other cases of A. xylos oxidans endocarditis have been described in the literature (these are summarized in Table 2). Including our patient, affected patients were older than 75 yrs in 22% (5/23) of the cases [7–10] and all had significant comorbidity.

Eight of the patients (36%) had a prosthetic valve [8,10–15]. The presence of a heart valve abnormality was a predisposing factor in 65% of cases (15/23).

Thirteen of the patients (57%) had surgery, but none of the patients older than 75 yrs of age; despite treatment with a combination of antibiotics, only one patient in this age range survived (20%, 1/5). Various antibiotics were administered depending on the specific case, with resistance to aminoglycosides and 4th generation cephalosporins and susceptibility to a combination of beta-lactam–beta-lactamase inhibitor, TMP/SMX, and carbapenems often reported. Two main mechanisms of intrinsic resistance of A. xylos oxidans to antibiotics are described: multidrug efflux pumps and beta-lactamase type chromosomal like-OXA-114 [28]. Antibiotic therapy is therefore a challenge, and a combination of antibiotics is most often used. However, some new antibiotics, such as cefiderocol (new generation cephalosporin) and eradavacycline (new tetracycline that is stable against efflux pumps), have been used in a few cases as rescue treatment.

Overall 10 of the patients died, giving a mortality rate of 43%: 15% of the patients managed with surgery (2 out of 13) died compared to 85% of the patients treated only with antibiotics [7,8]. This case thus suggests the importance of valve replacement surgery in managing A. xylos oxidans endocarditis; however, surgery is not always possible because of the operative risk and comorbidities, especially in frail elderly patients.

### Table 1

| Antibiotics              | MIC       | Interpretation CLSI 2016 |
|-------------------------|-----------|--------------------------|
| Amikacin                | >32       | R                        |
| Atezroan                | 32        | R                        |
| Cefotaxime              | >8        | R                        |
| Ceftazidime             | 4         | S                        |
| Ciprofloxacin           | 2         | I                        |
| Colistin                | 4         | I                        |
| Gentamicin              | >8        | R                        |
| Imipenem                | ≤0.5      | S                        |
| Meropenem               | ≤0.12     | S                        |
| Piperacillin/tazobactam | ≤1        | S                        |
| Tobramycin              | >8        | R                        |
| Trimethoprim/sulfamethoxazole | ≥1 | S |

MIC: Minimum inhibitory concentration in microgram/ml.
CLSI: Clinical and Laboratory Standards Institute.
R: resistant; I: intermediate; S: susceptible.

TEE showed slightly altered left ventricular ejection fraction (LVEF) at 45%, an improvement in right heart function compared to her previous TEE, and no sign of vegetation.

### Discussion

Infections with A. xylos oxidans infections are rare. Although this bacterium can cause various potentially severe infectious diseases, such as meningitis, pneumonia, and sepsis [2,3], cardiac involvement in the form of endocarditis has been rarely noted. When reported, it has mainly been in immunocompromised patients, and mostly with bacteremia [4].

The complications of endocarditis are embolic, and are readily revealed on PET-scan and magnetic resonance imaging (MRI) [3]. Although TEE is relatively poor at identifying vegetations, TEE is indispensable for their detection and specification [6].

Our patient met three of Duke’s criteria [5], two major criteria (persistently positive blood cultures and oscillating intracardiac vegetations on the posterior mitral valve), and one minor criterion (a rheumatic mitral valve with moderate insufficiency).

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Table 2
Review of published cases of Achromobacter xylosoxidans endocarditis.

| Author                  | Age  | Risk factor | Comorbidity                     | Affected valve | Valve prosthesis | Antibiotics prescribed                                      | Surgery | Outcome |
|-------------------------|------|-------------|---------------------------------|----------------|------------------|------------------------------------------------------------|---------|---------|
| Rodrigues et al. [7]    | 86 yrs | NR          | Pulmonary fibrosis, IHD, CKD    | Aortic         | no               | Piperacillin-tazobactam+TMP-SMX                             | no      | survived |
| Tokuyasu et al. [8]     | 86 yrs | PrV         | NR                              | Aortic         | yes              | Carbapenem                                                | no      | Died    |
| Ahmed et al. [11]       | 69 yrs | PrV         | None                            | Mitral and aortic | no               | Meropenem                                                 | no      | Died    |
| De Castro et al. [16]   | 19 yrs | CS, aortic bicuspid | none                           | Aortic         | no               | Meropenem                                                 | yes     | survived |
| Leoey et al. [17]       | 6 months | Venous catheter, Mitral stenosis rheumatic | Arterial calcification | Mitral         | no               | Piperacillin-tazobactam + TMP-SMX + colistin + meropenem + levofloxacin | no      | survived |
| Derber et al. [12]      | 54 yrs | PrV + Fallot's tetralogy. | Fallot's tetralogy. | Pulmonary       | yes              | Piperacillin-tazobactam + imipenem + cilastatin levofloxacin | yes     | NR      |
| Kumar et al. [19]       | 54 yrs | NC          | CKD, H                          | Mitral and aortic | no               | Vancomycin + piperacillin-tazobactam + gentamicin         | yes     | NR      |
| Rafael et al. [20]      | 50 yrs | CS          | Ventricular septum surgery      | Pulmonary and ventricle repair | no               | NC                                                        | yes     | survived |
| Sawant et al. [13]      | 62 yrs | PrV + Pacemaker | AF, HF, COPD, CABG            | Mitral Aortic Pacemaker | yes/no/-         | Piperacillin-tazobactam + TMP-SMX + amikacin + meropenem + rifampicin | yes     | survived |
| Malek-Marin et al. [21] | 50 yrs | Catheter    | CKD                             | NR             | NR               | Meropenem                                                 | yes     | Died    |
| Van Hal et al. [14]     | 37 yrs | PrV IHD     | NR                              | Aortic         | yes              | Carbapenem                                                | yes     | survived |
| Yang et al. [22]        | 35 yrs | IHD, TIA pacemaker | Hepatitis C                    | Tricuspid      | no               | Piperacillin-tazobactam + amikacin + ceftazidime          | yes     | NR      |
| Tamashihil et al. [23]  | 46 yrs | NR          | Diabetes, B. emphysema          | Mitral Aortic | NR               | Ampicillin + piperacillin + cotrimoxazole                  | yes     | survived |
| Ahn et al. [24]         | 35 yrs | CS pacemaker | CS                              | Pacemaker and ventricular repair | NR               | Ceftazidime + amikacin                                    | yes     | survived |
| Martino et al. [25]     | 33 yrs | Venous catheter | Bone marrow transplantation      | NR             | NR               | Aztreonam+amikacin                                        | no      | Died    |
| Davis et al. [26]       | 30 yrs | NC          | HF                              | NR             | NR               | Tobramycin + carbenicillin + TMP-SMX + moxalactam         | no      | Died    |
| Lofgren et al. [10]     | 77 yrs | PrV         | rheumatic heart disease PrV     | Mitral and aortic | yes for PrV only | Tobramycin + carbenicillin + TMP-SMX + moxalactam         | no      | Died    |
| Bhattari et al. [27]    | 37 yrs | PrV         | NR                              | Mitral         | yes              | Meropenem                                                 | yes     | survived |
| Olson et al. [15]       | 35 yrs | Aortic Surgery valve | NR                              | Aortic         | yes              | Carbencillin + TMP-SMX + rifampicin + moxalactam + azlocillin | no      | Died    |
| Xia et al. [29]         | 66 yrs | Venous catheter | H, DM, CKD                     | Mitral         | no               | Levofloxacin/Cefepime.                                    | no      | Died    |
| This case               | 81 yrs | Mitral       | Mitral                          | Mitral         | no               | Piperacillin-tazobactam + TMP-SMX + Meropenem + TMP-SMX   | no      | Died    |

AoS – aortic stenosis; AF – atrial fibrillation; NR - not reported; IHD – ischemic heart disease; PrV – prosthetic valve; CKD – chronic kidney disease; TIA – transient ischemic attack; HF – heart failure; H – hypertension; CS – cardiac surgery; P – pulmonary; COPD – chronic obstructive pulmonary disease; DM – diabetes mellitus; CABG – coronary artery bypass surgery; B – ischemic stroke; TMP – trimethoprim; SMX – sulfamethoxazole
Conclusion

Diasgnosing and managing A. xylosoxidans endocarditis in an older patient can be difficult because of atypical clinical presentation and the frequent presence of significant comorbidity. Valve replacement is the preferred management approach if the surgical risk is acceptable, especially in patients with heart failure or significant vegetations. Adequate antibiotic therapy can stabilize the patient’s clinical condition; however, it does not guarantee the condition will not recur if the antibiotics are not combined with valve replacement surgery, especially in an older frail subject. The rarity of this condition does not currently enable a consensus on management to be determined. Surgical valve replacement combined with combinations of antibiotics seems to be the best option. The description and analysis of new cases will improve knowledge and management of this pathology.

Authors agreement

The authors have participated in modifications of the manuscript and agree with them.

Ethical approval

I confirm that written informed consent was obtained from the patient for publication of this case report. All those, that this case report does not contain any personal identifiers.

Consent statement

I declare on my honor that this information was provided with the patient’s consent and anonymity. Everything can be verified in our institution with the appropriate agreements.

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CRediT authorship contribution statement

All authors were involved in writing the first draft of the manuscript. All authors read and approved the final submitted version.

Authors statements

1-Joseph KENGNI TAMEZE, Geriatric department; 2-Keizah KORPAK, Geriatric department; 3-Michele COMPAGNE, Geriatric department; 4-Henriannie LEVIE, Geriatric department; 5-Soraya CHERIFI, Infectious disease department; 6-Salah Eddine LALI, Clinical department; 4-Henriannie LEVIE, Geriatric department; 5-Soraya CHERIFI, Infectious disease department; 3-Michele COMPAGNE, Geriatric department.

Conflict of interest

None.

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