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Case report

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

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ABSTRACT

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.

Introduction

Achromobacter xylosoxidans (A. xylosoxidans) is a Gram-negative aerobic bacterium that was first described in 1971 by Yabuuchi 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 erythrocyanosis 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

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Table 1
Antibiogram: Sensititre thermo fisher technique.

Antibiotics	MIC	Interpretation CLSI 2016
Amikacin	> 32	R
Aztreonam	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.

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. xylosoxidans*. 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. TTE 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 leaflet, confirming a diagnosis of mitral endocarditis.

TMP/SMX was added to the piperacillin/tazobactam antibiotic therapy. A positron emission tomography (PET)-scan showed no embolic lesions or vascular damage.

On the 14th day post-admission, *A. xylosoxidans* was again isolated from the blood cultures, with the same antibiogram. Subsequent blood cultures remained negative.

Mitral valve replacement surgery was not possible because of the patient's considerable comorbidity and precarious functional status. Treatment was therefore medical, with the dual antibiotic therapy for a total of six weeks to which the patient seemed to respond well; after two months in hospital, she was discharged to her nursing home.

However, six days after discharge, the patient was readmitted with pyrexia and dyspnea and a recurrence of the biological inflammatory syndrome. She also showed signs of cardiac decompensation, both clinical and radiological. Empirical antibiotic therapy was started with ceftazidime (2 g 3 times per day).

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.

A. xylosoxidans was again isolated from the blood cultures, with the same antibiogram (Table 1). The patient was prescribed dual antibiotic therapy with meropenem and TMP/SMX. Unfortunately, despite the antibiotic therapy and medical treatment of the cardiac decompensation, the patient's clinical condition gradually deteriorated, and she died one month after readmission.

Discussion

Infections with *A. xylosoxidans* 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) [5]. Although TTE 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).

To our knowledge, only 22 other cases of *A. xylosoxidans* 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. xylosoxidans* 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 eravacycline (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. xylosoxidans* endocarditis; however, surgery is not always possible because of the operative risk and comorbidities, especially in frail elderly patients.

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
Storey et al. [9]	79 yrs	None	AF, TIA, H	Mitral and aortic	no	Meropenem	no	Died
Ahmed et al. [11]	69 yrs	PrV	DM, CABG, H	Mitral and aortic	yes for aortic only	Ertapenem + tigecycline + TMP/SMX	yes	Died
De Castro et al. [16]	19 yrs	CS, aortic bicuspid	none	Aortic	no	Meropenem	yes	survived
Leroy et al. [17]	6 months	Venous catheter,	Arterial calcification	Mitral	no	Piperacillin-tazobactam + TMP-SMX + colistin + meropenem + levofloxacin	no	survived
Tea et al. [18]	67 yrs	Mitral stenosis rheumatis m	Splenectomy	Mitral	no	Piperacillin-sulbactam + imipenem	yes	NR
Derber et al. [12]	54 yrs	PrV + Fallot's tetralogy.	Fallot's tetralogy	Pulmonary	yes	Piperacillin-tazobactam + imipenem-cilastatin levofloxacin	yes	survived
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	NR	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
Nanuashvili li et al. [23]	46 yrs	NR	Diabetes, IS, emphysema	Mitral Aortic	NR	Ampicillin + tazobactam + 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	NR	no	Died
Lofgren et al. [10]	77 yrs	PrV	rheumatic heart disease PrV	Mitral and aortic	yes for PrV only	Tobramycin + carbapenicillin + TMP-SMX + moxalactam	no	Died
Bhattarai et al. [27]	37 yrs	PrV	NR	Mitral	yes	Meropenem	yes	survived
Olson et al. [15]	35 yrs	Aortic Surgery valve	NR	Aortic	yes	Carbenicillin + TMP-SMX + rifampicin + moxalactam + azlocillin	no	Died
Xia et al. [29]	66 yrs	Venous catheter	H, DM, CKD	Mitral	no	Levofloxacine/Cefepime. Meropenem	no	Died
This case	81 yrs	Mitral rheumatic AoS	AF, HF	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 rafting; IS – ischemic stroke; TMP – trimethoprim; SMX – sulfamethoxazole

Conclusion

Diagnosing 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, thas 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

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Conflict of interest

None.

References

[1] Yabuuchi E, Oyama A. Achromobacter xylosoxidans n. sp. from human ear discharge. Jpn J Microbiol 1971;15(5):477–81. https://doi.org/10.1111/j.1348-0421.1971.tb00607.x

[2] Shigeta S, Yasunaga Y, Honzumi K, Okamura H, Kumata R, Endo S. Cerebral ventriculitis associated with Achromobacter xylosoxidans. J Clin Pathol 1978;31(2):156–61. https://doi.org/10.1136/jcp.31.2.156

[3] Marion-Sanchez K, Lion F, Olive C, Cailleaux G, Roques F. Mediastinitis superinfected by Achromobacter xylosoxidans. A case report. J Infect Chemother 2018;24(12):987–9. https://doi.org/10.1016/j.jiac.2018.05.005

[4] Aisenberg G, Rolston KV, Safdar A. Bacteremia caused by Achromobacter and Alcaligenes species in 46 patients with cancer (1989–2003). Cancer 2004;101(9):2134–40. https://doi.org/10.1002/cncr.20604

[5] Carballo S, Rossel A, Carballo D. Diagnostic et prise en charge précoce des endocardites infectieuses. Rev Med Suisse 2012 2012;2(358):1966–71.

[6] González-Alujas MT, García del Castillo H, Evangelista A, Soler-Soler J. Utilidad de la ecocardiografía transesofágica en el diagnóstico de la endocarditis infecciosa y sus complicaciones [The usefulness of transesophageal echocardiography in the diagnosis of infectious endocarditis and its complications]. Rev Esp Cardiol 1994;47(10):672–7. [Spanish].

[7] Rodrigues CG, Rays J, Kanegae MY. Native-valve endocarditis caused by Achromobacter xylosoxidans: a case report and review of literature. Autops Case Rep 2017;7(3):50–5. https://doi.org/10.4322/acr.2017.029

[8] Tokuyasu H, Fukushima T, Nakazaki H, Shimizu E. Infective endocarditis caused by Achromobacter xylosoxidans: a case report and review of the literature. Intern Med 2012;51(9):1133–8. https://doi.org/10.2169/internalmedicine.51.6930

[9] Storey A, Wilson A, McWilliams E. Native valve infective endocarditis due to Achromobacter xylosoxidans in an apparently immunocompetent individual. BMJ Case Rep 2010;2010:bcr0620103104https://doi.org/10.1136/bcr.06.2010.3104

[10] Lofgren RP, Nelson AE, Crossley KB. Prosthetic valve endocarditis due to Achromobacter xylosoxidans. Am Heart J 1981;101(4):502. https://doi.org/10.1016/0002-8703(81)90144-7

[11] Ahmed MS, Nistal C, Jayan R, Kuduvalli M, Anijeet HK. Achromobacter xylosoxidans, an emerging pathogen in catheter-related infection in dialysis population causing prosthetic valve endocarditis: a case report and review of literature. Clin Nephrol 2009;71(3):350–4. https://doi.org/10.5414/cnp71350

[12] Derber C, Elam K, Forbes BA, Bearman G. Achromobacter species endocarditis: a case report and literature review. Can J Infect Dis Med Microbiol 2011;22(3):e17–20. https://doi.org/10.1155/2011/527412. [Fall].

[13] Sawant AC, Srivatsa SS, Castro LJ. Alcaligenes xylosoxidans endocarditis of a prosthetic valve and pacemaker in a 62-year-old woman. Tex Heart Inst J 2013;40(1):95–8.

[14] van Hal S, Stark D, Marriott D, Harkness J. Achromobacter xylosoxidans subsp. xylosoxidans prosthetic aortic valve infective endocarditis and aortic root abscesses. J Med Microbiol 2008;57(Pt 4):525–7. https://doi.org/10.1099/jmm.0.47496-0

[15] Olson DA, Hoeprich PD. Postoperative valve endocarditis due to Achromobacter xylosoxidans. West J Med 1982;136(2):153–7.

[16] de Castro RL, Lima NA, Lino DODC, Melgar TA. A rare case of non-prosthetic aortic valve infectious endocarditis caused by Achromobacter xylosoxidans. Am J Case Rep 2020;21:e923031https://doi.org/10.12659/AJCR.923031

[17] Levoy CS, Hall DJ, Berman D. Achromobacter xylosoxidans endocarditis and septic arthritis in an infant affected by generalized arterial calcification of infancy. JMM Case Rep 2015;2(6):1–4.

[18] Tea I, Caruso M, Gary P, al. A Koi Diagnosis: Achromobacter xylosoxidans as an unusual cause of mitral valve endocarditis. J Am Coll Cardiol 2019;73(9):2999. [Supplement 1].

[19] Kumar S, Khaira J, Penigalapati D, Apurva A. Native Valve Endocarditis in a dialysis patient by Achromobacter xylosoxidans, a rare pathogen. J Glob Infect Dis 2017;9(2):85.

[20] Rafael AE, Keshavamurthy S, Sepulveda E, Miranda CC, Okamoto T, Pettersson GB. Intracardiac abscess with cutaneous fistula secondary to ventricular septal defect repair simulating sternal wound infection. Tex Heart Inst J 2014;41(3):324–6. https://doi.org/10.14503/THIJ-13-3199

[21] Malek-Marín T, Arenas MD, Perdiguero M, Salavert-Lleti M, Moledous A, Cotilla E, et al. A case of endocarditis of difficult diagnosis in dialysis: could 'best' friends be involved? Clin Nephrol 2009;72(5):405–9.

[22] Yang CH, Shing NC, Lu DCT. Infective endocarditis due to Achromobacter xylosoxidans with spondylodiscitis: a case report. J Intern Med Taiwan 2007;18(4):212–6.

[23] Nanuashvili A, Kacharava G, Jashiashvili N. A case of native valve infective endocarditis caused by Alcaligenes xylosoxidans. Eur Surveill 2007;12(5):E070524.2https://doi.org/10.2807/esw.12.21.03199-en

[24] Ahn Y, Kim NH, Shin DH, Park OY, Kim W, Jeong MH, et al. Pacemaker lead endocarditis caused by Achromobacter xylosoxidans. J Korean Med Sci 2004;19(2):291–3. https://doi.org/10.3346/jkms.2004.19.2.291

[25] Martino P, Micozzi A, Venditti M, Gentile G, Girmenia C, Raccah R, et al. Catheter-related right-sided endocarditis in bone marrow transplant recipients. Rev Infect Dis 1990;12(2):250–7. https://doi.org/10.1093/clinids/12.2.250

[26] Davis M, Gratten M, Ree GH. Infective endocarditis caused by Actinobacillus actinomycetemcomitans and Achromobacter xylosoxidans. P N G Med J 1982;25(1):7–11.

[27] Bhattarai M, Papireddy M, Kulkami S. A rare case of complicated Achromobacter xylosoxidans endocarditis and its successful management. J Hosp Med 2016;11(Suppl. 1).

[28] Isler B, Kidd TJ, Stewart AG, Harris P, Paterson DL. Achromobacter infections and treatment options. Antimicrob Agents Chemother 2020;64(11). https://doi.org/10.1128/AAC.01025-20. [e01025-20].

[29] Xia R, Otto C, Zeng J, Momeni-Boroujeni A, Kagan J, Meleney K, et al. Achromobacter endocarditis in native cardiac valves – an autopsy case report and review of the literature. Cardiovasc Pathol 2018;36:6–10. https://doi.org/10.1016/j.carpath.2018.05.003. [Epub 2018 May 22].