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Case report

# Isolated *Enterococcus faecalis* pulmonary valve endocarditis without precipitating risk factors: A case report describing delayed need for surgery three years after antimicrobial therapy

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ABSTRACT

*Introduction and importance:* Isolated *Enterococcus faecalis* pulmonary valve endocarditis (PVE) without precipitating risk factors is exceeding rare, as fewer than ten cases have been published in the literature, most of which did not require surgical intervention.

*Case presentation:* An elderly individual presented for evaluation of dyspnea, fatigue, dizziness, weight loss, and a low-grade fever. The patient denied intravenous drug abuse, blood-borne viral infection, cardiac trauma, congenital heart disease, and immunocompromise. Echocardiography identified a large vegetation on the right pulmonary valve leaflet consistent with isolated PVE. Blood cultures grew *E. faecalis*. Computed tomography failed to reveal an infectious source. The patient completed a six-week course of antibiotics and was followed with serial echocardiography for three years, but subsequently developed severe pulmonic insufficiency and right heart failure necessitating pulmonary valve replacement.

*Clinical discussion:* Isolated PVE is responsible for less than 2.0% of all cases of infective endocarditis. The vast majority of reported cases are associated with risk factors and are caused by gram-positive organisms including *Staphylococcus species* and *Streptococcus viridans*. Echocardiography identifies most cases of isolated PVE. Septic embolization of vegetation fragments to lung parenchyma is common. Surgery is reserved for patients who are unresponsive to antibiotics or those who develop severe pulmonary insufficiency with symptoms of right heart failure, as seen here.

*Conclusion:* We present an unusual case of isolated *E. faecalis* PVE without known risk factors that required pulmonary valve replacement three years after antimicrobial therapy.

## 1. Introduction

Infective endocarditis of right heart valves accounts for 5 to 10% of all cases of the disease. The tricuspid valve is the most commonly affected, whereas isolated pulmonary valve endocarditis is very rare. Intravenous drug use (often in conjunction with human immunodeficiency or hepatitis C virus co-infection), the presence of chronically indwelling catheters or implanted devices, previous valve damage, and congenital heart disease have been identified as important risk factors for right-sided endocarditis [1–3]. Right-sided endocarditis usually responds to intravenous antibiotic therapy, but valve repair or replacement may be required when heart failure is present; bacteremia persists, vegetations enlarge, or local tissue invasion (*e.g.*, abscess, pseudoaneurysm) develops; recurrent pulmonary septic emboli occur; or severe regurgitation results from progressive valve damage [2–4]. Isolated pulmonary valve endocarditis has been reported in approximately 28% of patients without apparent risk factors [5,6]. The diagnosis requires a high index of suspicion [3,7], as only persistent unexplained fever, pulmonary symptoms that mimic other common bacterial or viral infections, or constitutional complaints may be present

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[4,8,9]. We describe a patient with isolated *Enterococcus faecalis* pulmonary valve endocarditis who did not have precipitating risk factors. The patient was successfully treated with antibiotics and followed with serial echocardiography, but subsequently developed severe pulmonic insufficiency and symptoms of right heart failure necessitating pulmonary valve replacement. Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request. The work has been reported in accordance with SCARE 2020 criteria [10].

## 2. Case report

An elderly individual with essential hypertension, morbid obesity, and a history of stroke was first admitted to the authors' institution three years ago for evaluation of dyspnea, fatigue, dizziness, weight loss, and a low-grade fever. The patient denied intravenous drug abuse, bloodborne viral infection, cardiac trauma, and congenital heart disease. The patient had no symptoms of heart failure. Blood cultures were obtained as part of his initial work-up; these cultures grew *E. faecalis*. Transthoracic and transesophageal echocardiography examinations identified a large vegetation on the right pulmonary valve leaflet. Intravenous ampicillin and ceftriaxone were begun for treatment of endocarditis. Thoracic, abdominal, and pelvic computed tomography (CT) failed to reveal a source for the infection, but an incidental left upper lobe pulmonary nodule was discovered that was suspicious for malignancy. A colonoscopy showed diverticulosis but no other abnormalities were noted. The patient's hospital course was complicated by the development of acute kidney injury. The patient also developed breakthrough fever and pancytopenia approximately one month after antibiotic therapy was begun. New septic emboli were also noted on repeat thoracic CT. The antibiotics were changed to vancomycin and gentamicin, but were subsequently switched back to the original regimen because the renal function deteriorated further. Surgical intervention was considered but was excluded during the patient's initial admission because of the severity of the systemic infection, the presence of acute kidney injury, and the absence of overt heart failure.

The patient completed a six-week course of antibiotics and recovered. Outpatient transthoracic echocardiography performed two months later showed two pulmonary valve vegetations that remained stable in size during surveillance echocardiography examinations conducted at six-month intervals. The patient continued to deny heart failure symptoms. The patient subsequently underwent a video-assisted thoracoscopic wedge resection of the left upper lobe nodule, which had enlarged on a follow-up thoracic CT scan. The pathology demonstrated T2aN0 adenocarcinoma. The patient made an uneventful recovery from this surgery. The patient later contracted COVID-19 during the pandemic's fall 2020 peak. The patient was hospitalized and suffered a pulmonary embolism during treatment, but recovered without further sequelae.

Three years after the initial presentation, the patient reported worsening dyspnea at rest and on exertion, fatigue, intermittent palpitations, and lower extremity swelling. The patient denied chest pain, orthopnea, and other constitutional complaints. The physical examination was notable for a diastolic murmur and mild bilateral lower extremity pitting edema. Transthoracic echocardiography documented severe pulmonic insufficiency with right ventricular (RV) dilatation and reduced RV ejection fraction consistent with RV failure. Pulmonary valve replacement was recommended. The patient underwent coronary angiography, which showed flow-limiting stenoses of the left main, left circumflex, and right coronary arteries. Five teeth were also extracted for dental clearance in anticipation of surgery. The patient was taken to the operating room, where an intraoperative transesophageal echocardiography (TEE) examination was performed after anesthetic induction and endotracheal intubation. A large pulmonary valve vegetation was identified in the midesophageal ascending aortic short axis and right ventricular inflow-outflow TEE views (Figs. 1 and 2; video clips 1 and 2)

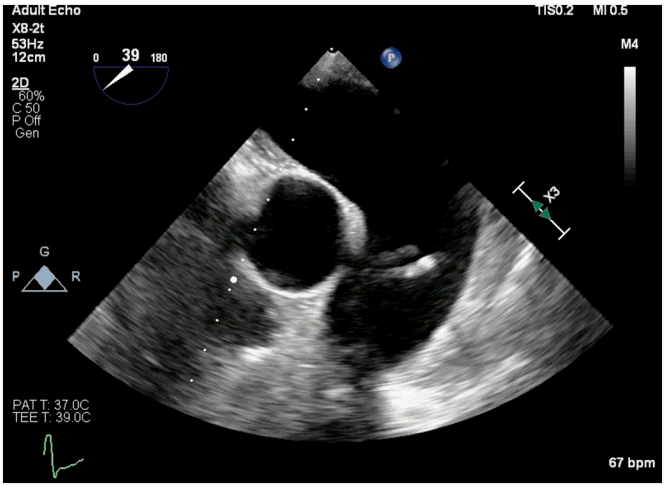


**Fig. 1.** Midesophageal ascending aortic short axis TEE view obtained during systole showing large pulmonary valve vegetation in the proximal pulmonary artery.

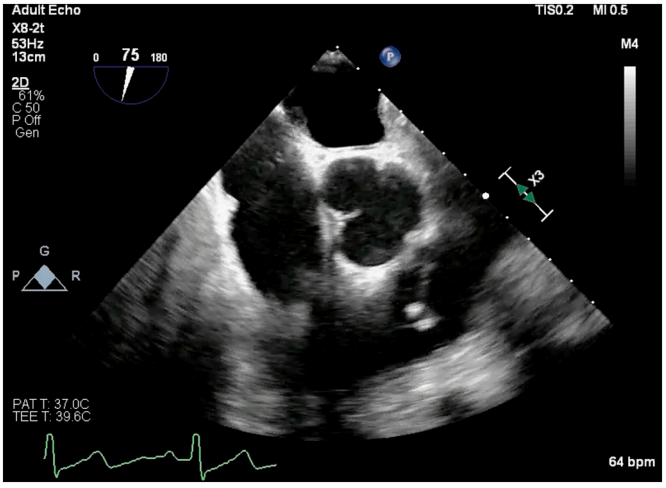


**Fig. 2.** Midesophageal right ventricular inflow-outflow TEE view obtained during diastole showing large pulmonary valve vegetation in the right ventricular outflow tract.

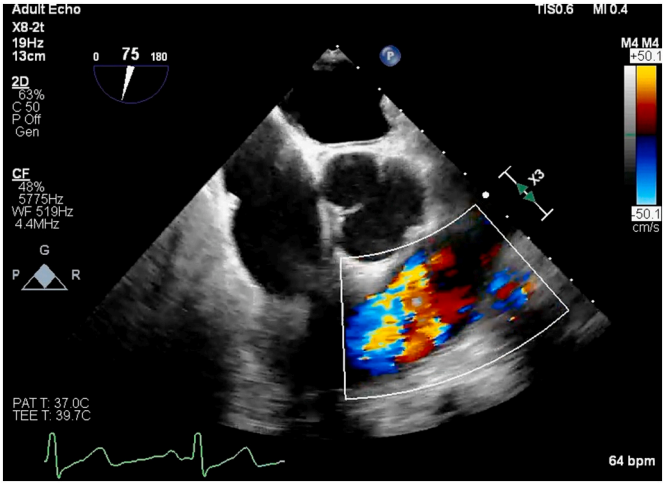


**Fig. 3.** Midesophageal right ventricular inflow-outflow TEE color Doppler view showing severe pulmonic insufficiency.

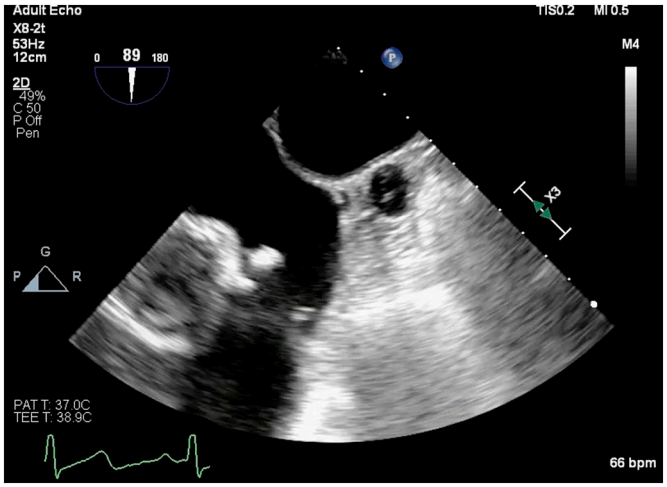


**Fig. 4.** Upper esophageal aortic arch short axis TEE view obtained during systole showing large pulmonary valve vegetation in the proximal pulmonary artery.

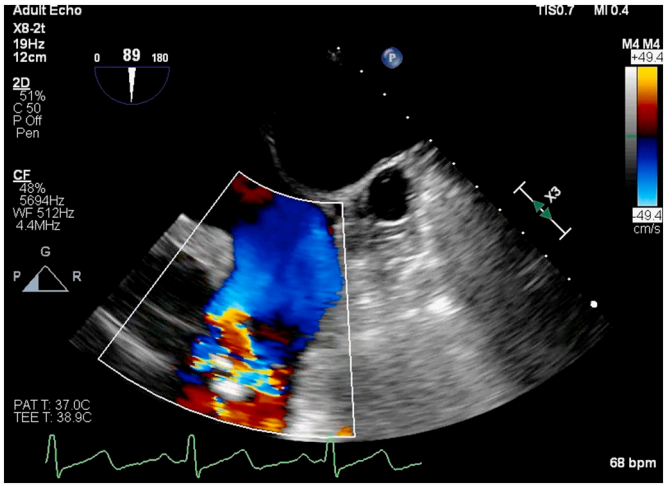


**Fig. 5.** Upper esophageal aortic arch short axis TEE color Doppler view showing severe pulmonic insufficiency.

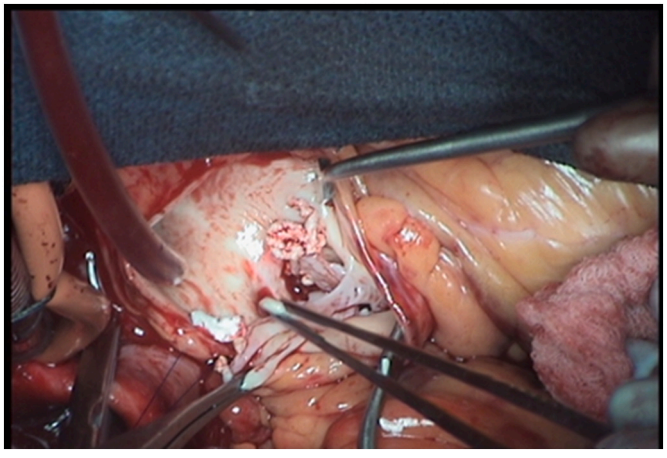

**Fig. 6.** Intraoperative photograph showing large vegetation on the right pulmonary valve leaflet (above forceps).

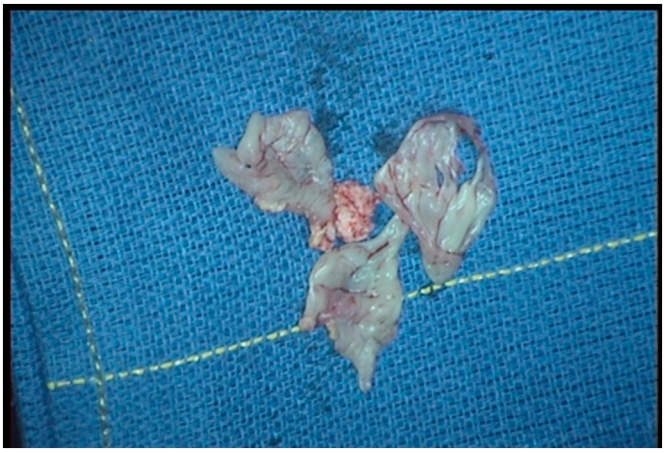

**Fig. 7.** Intraoperative photograph depicting excised pulmonary valve with vegetation (middle of valve).

associated with severe pulmonic insufficiency (Fig. 3; video clip 3). The pathology was also clearly seen in the upper esophageal aortic arch short axis TEE two-dimensional and color Doppler views of the pulmonary valve (Figs. 4 and 5; video clips 4 and 5). Inspection of the native pulmonary valve during cardiopulmonary bypass revealed a healed calcific vegetation (Figs. 6 and 7) of one leaflet and large perforations in the other two leaflets with evidence of dehiscence. There was no active infection. The native valve was excised and replaced with a 27 mm porcine bioprosthesis by a senior cardiothoracic surgeon (GHA) with 35 years-experience. The left internal mammary artery was used to bypass the first diagonal coronary artery and saphenous vein grafts were used to bypass the first obtuse marginal and distal right coronary arteries. The patient separated from cardiopulmonary bypass with inotropic support (intravenous infusions of milrinone and norepinephrine). Cultures of the excised pulmonary valve and vegetation were negative. The patient required reexploration for postoperative bleeding on the first postoperative day, but the remainder of the hospital course was uneventful and the patient was discharged on the 7th postoperative day.

## 3. Discussion

Isolated pulmonary valve endocarditis is responsible for 1.5% to 2.0% of all cases of infective endocarditis [7]. The relative rarity of isolated pulmonary valve endocarditis was emphasized in a study of right-sided endocarditis in intravenous drug abusers in which 4 of 132 (3.0%) cases involved only the pulmonary valve [11]. Indeed, Tariq *et al* documented only 38 published cases of isolated pulmonary valve endocarditis occurring on structurally normal valves in their forty-year review [5]. Not surprisingly, isolated native pulmonary valve endocarditis was less common than infection involving a prosthetic pulmonary valve or conduit [12]. The most common bacteria responsible for right-sided endocarditis (including isolated pulmonary valve disease [13]) are *Staphylococcus aureus*, coagulase-negative *S. species*, or *Streptococcus viridans* [4,14,15], but *E. faecalis* was identified as the causative organism in 2.6% of cases [5,16]. For example, Miranda *et al* reviewed nine cases of isolated pulmonary valve endocarditis treated at the Mayo Clinic from 2000 to 14 [17]. The authors reported that three of their patients had congenital heart disease, two had central venous catheters, three had implanted cardiac devices, and five were immunocompromised. Pulmonary valve vegetations were identified using transthoracic or transesophageal echocardiography in nine patients; four were treated conservatively and five required pulmonary valve replacements. Interestingly, *E. faecalis* and viridans group streptococci, and not *S. aureus*, were the most commonly identified responsible organisms in this series [17]. *E. faecalis* was also identified as the causative organism responsible for isolated pulmonary valve in an otherwise healthy man who had

previously undergone a colonoscopy and polypectomy [18]. Thus, isolated *E. faecalis* endocarditis of the pulmonic valve is very rare, as less than ten cases have been published in the literature to date, and many of these cases were associated with known risk factors, unlike the current case.

Most cases of isolated pulmonary valve endocarditis are recognized with transthoracic echocardiography [4], but the combined use of both transthoracic and transesophageal approaches may improve the diagnostic utility of echocardiography compared with a single imaging modality alone [12]. Both imaging techniques were used here to define the current patient's disease upon initial presentation. Septic embolization of vegetation fragments to lung parenchyma is commonly encountered in patients with untreated isolated pulmonary valve endocarditis and is associated with adverse sequelae including pneumonia, pneumothorax, and sepsis [19]. The current patient had pulmonary septic embolization during the first admission, but this complication of endocarditis responded to antibiotic treatment. Pulmonic insufficiency usually occurs late in the natural history of isolated pulmonary valve endocarditis and may be initially recognized by the appearance of an audible diastolic murmur [20], as observed in the current patient.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijscr.2021.106426.

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## Ethical approval

Not applicable.

## Consent

The patient provided informed consent for the publication of this case report. The report has been appropriately anonymized to exclude identifying characteristics other than medical history.

## Author contributions

Elise A. Biesboer MD: Writing original draft of manuscript; editing; approval for submission.

Gelique D. Ayala BS: Editing of manuscript; approval for submission.

Austin C. Cummings BS: Editing of manuscript; approval for submission.

Heather A. Sutter PA-C: Editing of manuscript; approval for submission.

Zafar Iqbal MD: Editing of manuscript; editing of transesophageal echocardiography images and video clips; approval for submission.

Paul S. Pagel MD PhD: Editing of manuscript; editing of transesophageal echocardiography images and video clips; approval for submission.

G. Hossein Almassi MD: Editing of manuscript; editing of intraoperative photographs; approval for submission.

## Research registration

Not applicable.

## Guarantor

G. Hossein Almassi MD.

## Provenance and peer review

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## Declaration of competing interest

None.

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