

Case report

Native pulmonary valve infective endocarditis in an adult without predisposing conditions: a case report

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ABSTRACT

Infective endocarditis of the pulmonary valve (PVIE) is an uncommon condition in adults whose clinical presentation often mimics pneumonia, leading to delayed recognition. A 38-year-old man without classic risk factors presented with fever and dyspnea and was initially treated as pneumonia without clinical improvement. Computed tomography pulmonary angiography revealed septic pulmonary emboli, and echocardiography demonstrated vegetation on the pulmonary valve with severe regurgitation. Blood cultures were negative. Due to the progression of vegetation size and clinical deterioration, pulmonary valve replacement was performed, with a favorable outcome. PVIE is difficult to diagnose because its presentation often resembles pneumonia, requiring a high index of clinical suspicion. Its clinical course is variable; large or progressive vegetations and significant valvular regurgitation constitute the main indications for surgical intervention. Early clinical suspicion and a multidisciplinary approach allow for timely diagnosis and improved prognosis.

Keywords: Endocarditis; Pulmonary Valve; Pulmonary Emboli; Valve Replacement (Source: MeSH-NLM).

RESUMEN

Endocarditis infecciosa de válvula pulmonar nativa en adulto sin condiciones predisponentes: reporte de caso

La endocarditis infecciosa de la válvula pulmonar (EIVP) es una entidad infrecuente en adultos, cuya presentación suele simular neumonía, lo que retrasa su reconocimiento. Presentamos el caso de un varón de 38 años, sin factores de riesgo clásicos, con fiebre y disnea, tratado como neumonía sin mejoría. La angiotomografía evidenció émbolos sépticos pulmonares y la ecocardiografía mostró vegetación en la válvula pulmonar con insuficiencia grave. Los hemocultivos fueron negativos. Ante la progresión del tamaño de la vegetación y del deterioro clínico, se realizó un reemplazo valvular pulmonar con evolución satisfactoria. La EIVP presenta dificultades para su diagnóstico debido a su presentación similar a una neumonía, requiere alta sospecha clínica. Su curso clínico es variable; las vegetaciones grandes o progresivas e insuficiencia valvular significativa constituyen las principales indicaciones quirúrgicas. La sospecha temprana y el abordaje multidisciplinario permiten un diagnóstico oportuno y un mejor pronóstico.

Palabras clave: Endocarditis; Válvula Pulmonar; Émbolos Pulmonares; Reemplazo Valvular (Fuente: DeCS-BIREME).

Introduction

Right-sided valvular involvement accounts for less than 10% of all cases of infective endocarditis (IE) and is primarily associated with risk factors such as intravenous drug use, intracardiac devices, structural cardiac abnormalities, and central venous or invasive haemodynamic monitoring catheters⁽¹⁻⁴⁾. The variable presentation and low incidence of pulmonary valve infective endocarditis (PVIE), which accounts for less than 2% of right-sided IE cases, make it difficult to recognise. Its clinical presentation is dominated by non-specific respiratory symptoms, such as cough and dyspnoea, and systemic symptoms, including malaise and fever. Consequently, PVIE can be mistaken for other respiratory conditions until an unfavourable clinical course prompts consideration of alternative diagnoses for a non-specific illness that responds only partially to antibiotic treatment⁽⁴⁻⁷⁾.

PVIE is uncommon and accounts for a small proportion of IE cases in adults compared with involvement of other cardiac valves⁽¹⁾. Reported annual incidence rates in developed countries vary, ranging from 3 to 10 cases per 100,000 people. Although PVIE has been reported to account for 0.8% of cases in Antioquia, and an average rate of valvular infective endocarditis of 0.31 cases per 10,000 inhabitants has been reported elsewhere in Colombia, its incidence in Latin America and the Caribbean remains understudied and poorly characterised⁽⁸⁻¹¹⁾.

The pathogens commonly implicated in right-sided IE include a broad range of bacteria, such as *Staphylococcus aureus*, *coagulase-negative staphylococci*, *viridans group streptococci*, *other streptococci*, and *Pseudomonas aeruginosa*, as well as fungi, including *Candida albicans*. Less frequently isolated pathogens include *Listeria spp.*, *Salmonella spp.*, and *Edwardsiella tarda*. However, any microorganism capable of forming vegetations and spreading haematogenously could potentially cause IE^(8,12,13).

We report the case of a young, immunocompetent patient with no classic predisposing factors for PVIE, whose diagnosis and treatment posed substantial challenges.

Case report

A 38-year-old man living in a rural area, who worked as a farmer and fisherman, reported frequent consumption of raw fish and untreated water. His medical history included current heavy smoking, alcohol use disorder, and intranasal cocaine use, which he had stopped 3 years previously. He denied intravenous drug use.

He presented with a 1-week history of diffuse abdominal pain and self-limiting episodes of diarrhoea after consuming "doncella" (*Coris julis*) fish broth. Four days after symptom onset, he developed fever, fatigue, and nausea, accompanied by progressive dyspnoea on minimal exertion. On admission, he was haemodynamically stable, with mild hypoxaemia requiring supplemental oxygen. Examination revealed bilateral crackles and regular heart sounds without murmurs. Inflammatory markers were elevated, and chest radiography showed bilateral interstitial opacities. Community-acquired pneumonia was diagnosed, and piperacillin-tazobactam was administered for 7 days. However, his condition did not improve. After antibiotic treatment was discontinued, recurrent fever, worsening dyspnoea, diffuse abdominal pain, and non-radiating retrosternal chest pressure prompted reconsideration of the working diagnosis.

An initial set of blood cultures remained negative after 5 days of incubation. An electrocardiogram (ECG) met the criteria for left ventricular hypertrophy, with no changes suggestive of ischaemia, and the high-sensitivity cardiac troponin I concentration exceeded the 99th percentile. Computed tomography pulmonary angiography excluded acute pulmonary embolism but showed signs of pulmonary congestion and multiple patchy subpleural

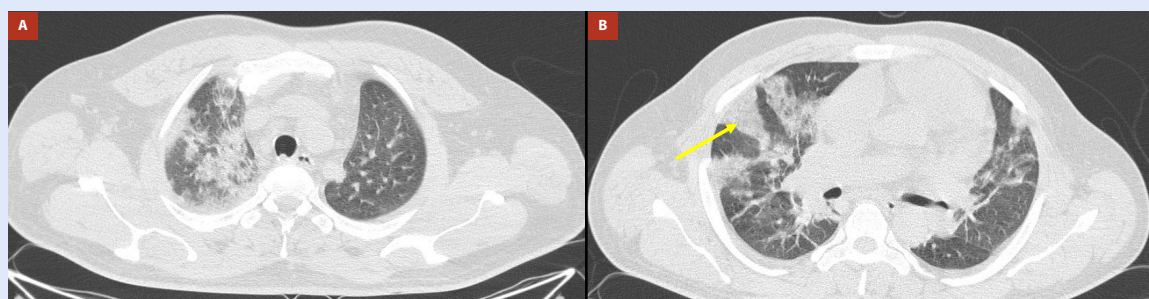


Figure 1. Multilobar airspace opacities on the patient's initial computed tomography pulmonary angiogram. Multiple bilateral pulmonary nodules form predominantly subpleural areas of consolidation in the upper (A) and lower (B) lobes, consistent with septic emboli. Some lesions are wedge-shaped, supporting haematogenous dissemination (yellow arrow).

and peribronchovascular consolidations consistent with septic emboli (**Figure 1**). These findings, together with a positive rheumatoid factor test, raised suspicion of infective endocarditis (IE). Three additional sets of blood cultures were obtained and were negative. Treatment with ceftriaxone, gentamicin, and vancomycin was initiated.

Transthoracic echocardiography (TTE) showed preserved ventricular function, with a left ventricular ejection fraction (LVEF) of 56%, and a dilated right ventricle with a basal diameter of 5.1 cm in the apical four-chamber view, without wall motion abnormalities. The left atrium was mildly dilated, with an indexed volume of 35 mL/m², and the right atrium was dilated, with an indexed volume of 32 mL/m². Moderate tricuspid regurgitation secondary to ventricular dilatation was present, with a vena contracta width of 0.5 cm. The pulmonary valve showed an amorphous mass of heterogeneous echogenicity with chaotic motion on the ventricular surface of the most anterior leaflet, measuring 1.6 x 1.0 cm, with an area of 1.5 cm². Associated leaflet destruction resulted in severe pulmonary regurgitation, with a deceleration time of 159 ms and a pressure half-time of 48 ms. The aortic and mitral valves and the great vessels were unremarkable. Estimated pulmonary artery systolic pressure was 31 mmHg, and tricuspid regurgitation velocity was 268 cm/s. The echocardiographic probability of pulmonary hypertension was low, and no shunts were identified (**Figure 2**).

These findings confirmed the diagnosis of pulmonary valve infective endocarditis (PVIE). The patient was assessed by the endocarditis team, which recommended surgery after optimisation of his pulmonary congestion. Antibiotic treatment was changed to ampicillin-sulbactam plus ceftriaxone because his exposure to untreated water and raw fish was considered to increase the risk of infection with *viridans group streptococci*, *Salmonella spp.*, and *Edwardsiella tarda*. As part of the investigation for blood culture-negative

endocarditis, two further sets of blood cultures were obtained and remained negative after prolonged incubation. Serological tests for *Brucella spp.*, *Bartonella henselae*, *Leptospira spp.*, and *Coxiella burnetii* were also negative.

After 1 week of treatment, the patient showed no improvement and developed dyspnoea at rest and respiratory distress. Repeat TTE showed persistent right ventricular dilatation, with a basal diameter of 4.7 cm in the apical four-chamber view, enlargement of the vegetation to 2.4 x 1.6 cm, with an area of 3.0 cm², and worsening pulmonary regurgitation parameters, with a deceleration time of 138 ms and a pressure half-time of 41 ms (**Figure 3**). He therefore underwent emergency surgery. Intraoperative findings included a 2.6 x 1.5 cm vegetation, complete destruction of the pulmonary valve, and extension into the right ventricular outflow tract. Complete excision was required, followed by implantation of a size 27 Epic bioprosthetic valve and pulmonary artery repair with an interposed pericardial patch.

His postoperative course was favourable, with no further surgical intervention required. He was discharged on postoperative day 7 to complete a 28-day course of ceftriaxone plus ampicillin-sulbactam, counted from the date of valve replacement, at home and to begin early cardiac rehabilitation. At follow-up 1 month after discharge, following completion of antibiotic treatment, he was asymptomatic and in excellent clinical condition, with recovery to New York Heart Association (NYHA) functional class I. Histopathological examination of the excised valve showed acute and chronic inflammation with fibrinoid material, without granulomas or bacterial colonies. Valve tissue cultures and special stains for mycobacteria, fungi, and parasites were negative. TTE showed preserved biventricular function, resolution of right ventricular dilatation, and a normally functioning bioprosthetic valve without paravalvular leaks (**Figure 4**).

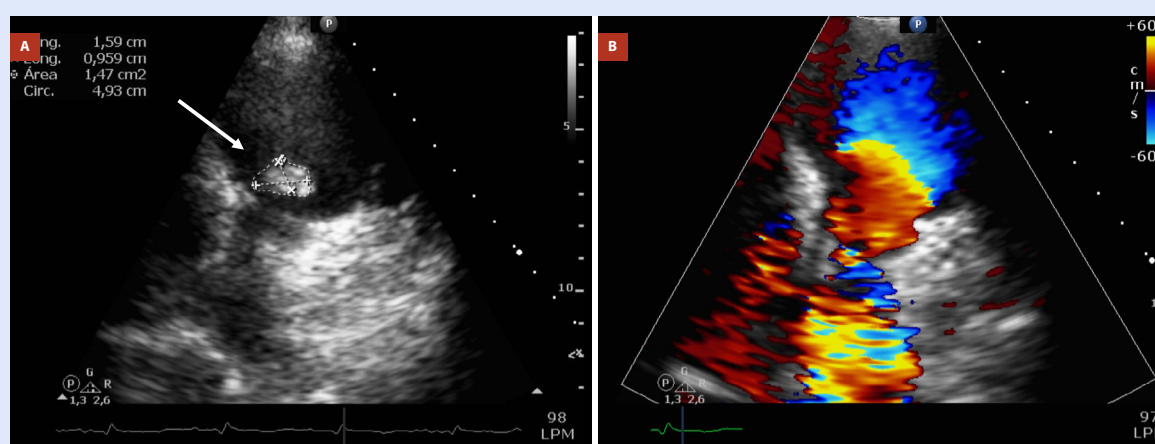


Figure 2. Initial transthoracic echocardiogram showing pulmonary valve endocarditis. (A) A vegetation measuring approximately 1.6 x 1.0 cm, with an area of 1.5 cm², is visible on the pulmonary valve (white arrow). (B) Colour Doppler imaging of the pulmonary valve shows a severe regurgitant jet during diastole.

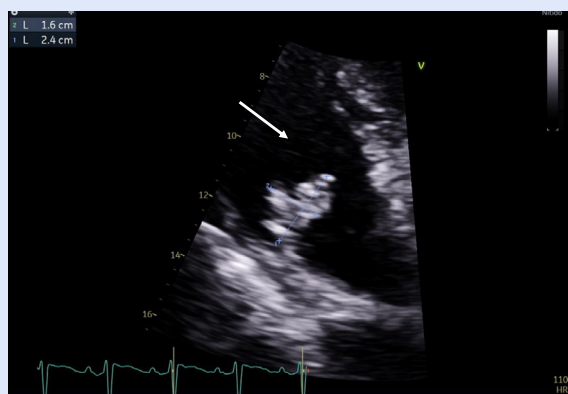


Figure 3. Repeat transthoracic echocardiogram showing progression of endocarditis. After 1 week of antibiotic treatment, the pulmonary valve vegetation had enlarged to 2.4 x 1.6 cm.

Discussion

We report the case of an adult with no recognised risk factors for PVIE whose diagnosis posed a substantial challenge

(**Figure 5**). Pulmonary valve involvement was isolated, and the patient had no history of intravenous drug use, intracardiac devices, congenital cardiac abnormalities, renal or liver transplantation, or invasive haemodynamic monitoring devices. These predisposing factors have been described in similar cases in which, unlike the present case, a causative microorganism was identified^(8,14-17).

The Duke criteria, which are widely used to diagnose IE and have a reported sensitivity exceeding 80%, have been validated for left-sided involvement but not for tricuspid or pulmonary valve involvement⁽⁸⁾. Consequently, these criteria are frequently extrapolated to right-sided IE in clinical practice. A definite clinical diagnosis requires at least two major criteria, such as positive blood cultures and echocardiographic evidence of vegetation, or one major and three minor criteria. In this case, although no causative microorganism was identified, echocardiography demonstrated a vegetation, and the patient had persistent fever and septic pulmonary emboli, leading to a definitive diagnosis of PVIE⁽¹⁸⁾.

Echocardiographic findings can be normal in up to 30% of cases. CT pulmonary angiography has therefore been described as an essential diagnostic adjunct for identifying pulmonary infarcts suggestive of septic emboli⁽⁴⁾. In the present case, CT pulmonary angiography first raised suspicion

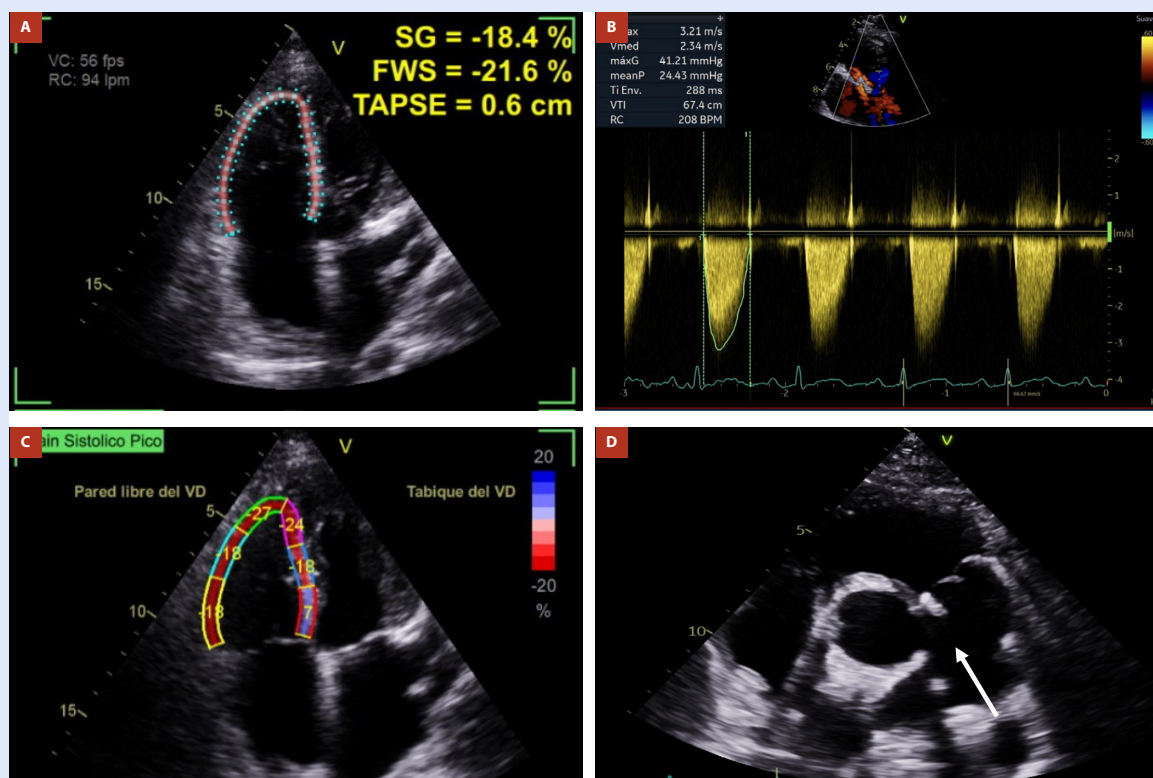


Figure 4. Follow-up echocardiogram after discharge. (A) Preserved right ventricular (RV) systolic function, with global longitudinal strain of -18.4% and free-wall longitudinal strain of -21.6%. (B) Normally functioning pulmonary valve prosthesis, with a peak velocity of 3.21 m/s and peak and mean gradients of 41 and 24 mmHg, respectively. (C) Segmental RV systolic strain assessment shows no akinetic segments. (D) The main pulmonary artery is not dilated, and the prosthetic valve is in position (white arrow).

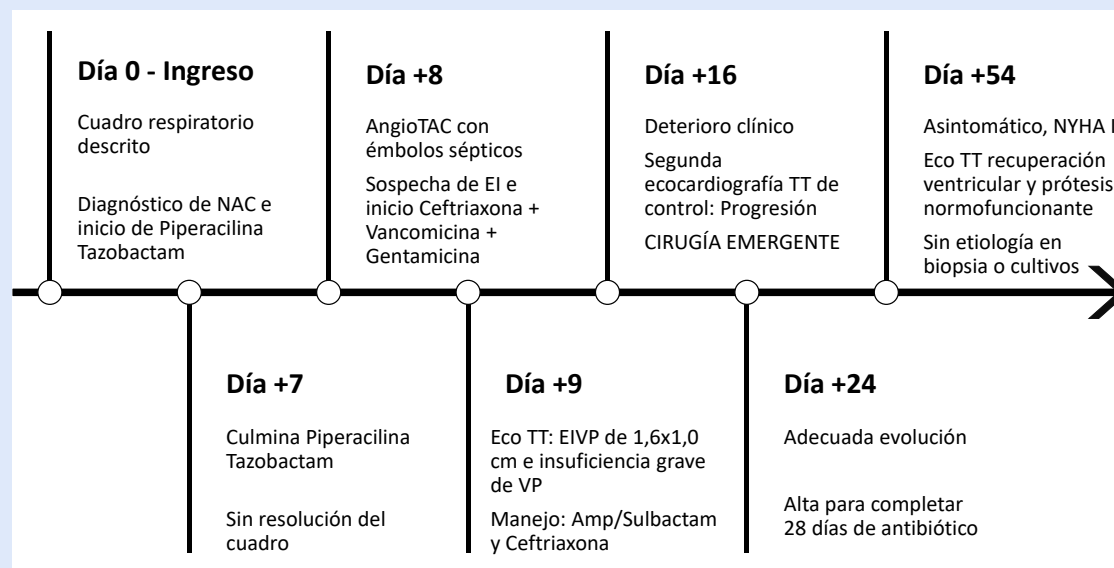


Figure 5. Timeline of the patient's clinical course.

of IE. Transthoracic echocardiography has also been reported to have higher detection rates than transoesophageal echocardiography (TOE) in right-sided IE. This finding reflects several limitations of TOE in this setting, including the anterior location of the pulmonary valve, potential confusion with intracardiac devices or tumour masses, and anatomical variations. Accordingly, TOE should be reserved for selected cases of right-sided IE, particularly PVIE ^(4,9,14).

Despite repeated attempts to identify a causative microorganism through consecutive sets of blood cultures, no pathogen was isolated. Possible explanations include the low diagnostic yield of blood cultures in right-sided IE, prior antibiotic exposure, or infection with fastidious organisms. In the absence of an identified pathogen, antibiotic treatment was guided by the patient's risk factors, providing coverage for *viridans group streptococci*, *Salmonella spp.*, and *Edwardsiella tarda*, with treatment continued for 28 days after source control. However, progressive heart failure and vegetation enlargement, associated with a high embolic risk, prompted urgent surgery. This clinical course is consistent with reports suggesting that, although right-sided IE generally has a more favourable prognosis, PVIE frequently requires surgery following failure of antimicrobial treatment ^(12-14,19). In particular, experience from the Mayo Clinic in the USA showed that PVIE could progress rapidly, resulting in a higher rate of surgical intervention, although complication and mortality rates remained low, at approximately 5% ^(15,20).

In conclusion, PVIE is an uncommon condition that poses a diagnostic challenge because of its non-specific presentation and the absence of dedicated diagnostic criteria. A high index of suspicion is essential to integrate clinical and imaging findings, establish a timely diagnosis, initiate antimicrobial treatment, and identify patients who require additional surgical management. This approach can improve outcomes, as illustrated by the present case.

Ethical aspects

This study was conducted in accordance with the ethical principles for medical research involving human participants set out in the Declaration of Helsinki and was approved by the institutional ethics committee. Written informed consent was obtained from the patient for publication of his clinical information, images, and supplementary material. All identifying information was removed to preserve patient confidentiality and anonymity. The authors also declare that no artificial intelligence was used in the preparation of this case report.

Author contributions

YIAE, IHO, LVDR, OAVU, and DTA: conceptualisation, data curation, formal analysis, investigation, methodology, resources, and writing-original draft. **MBGS, EMO, and JAGR:** project administration, conceptualisation, data curation, formal analysis, investigation, methodology, resources, writing-original draft, supervision, and visualisation.

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