

Isolated Fungal Pulmonary Endocarditis: Role of Transthoracic Echocardiography from the Diagnosis to Follow-up

Endocardite Fúngica Isolada da Válvula Pulmonar: o Papel do Ecocardiograma Transtorácico do Diagnóstico ao Acompanhamento

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Introduction

Pulmonary valve endocarditis, an uncommon entity, is associated with important complications such as pulmonary emboli, severe valvular regurgitation, and right-sided chamber dilatation and is usually concomitant with tricuspid valve endocarditis. Intravenous (IV) drug and cardiovascular implantable electronic device use are known risk factors for this condition. *Staphylococcus aureus* is the most prevalent causative bacteria, whereas fungi are rarely involved. Here, we present a case of *Candida albicans*-induced pulmonary valve endocarditis.

Case presentation

A 29-year-old woman with a medical history including a diagnosis of acute myeloid leukemia diagnosis in 2017, cardiotoxicity due to chemotherapy with high doses of anthracycline in 2017, and hematopoietic stem cell transplantation in 2018 was admitted for elective oncological treatment due to acute lymphocytic leukemia relapse. On admission, she was hemodynamically stable and her physical examination was unremarkable. She developed febrile neutropenia and a catheter-related bloodstream candidemia infection during the hospitalization. Despite antifungal treatment, she had persistent fever, while signs of embolization in the lungs, liver, and spleen were detected by computed tomography.

Transthoracic echocardiography (TTE) (Figure 1) demonstrated multiple filamentous mobile echodensities attached to the pulmonary valve, the largest being 1.2 cm in length. Transesophageal echocardiography (TEE) confirmed isolated right-sided infective endocarditis (IE). The cardiac surgery team recommended continued medical therapy with antifungal treatment. A follow-up TTE performed one week later (Figure 2) showed progression of the vegetations,

now extending into the right ventricle outflow tract (RVOT), without functional pulmonary valve impairment. The patient underwent surgical treatment with pulmonary valvuloplasty two weeks after the endocarditis diagnosis. Intraoperative echocardiography (Figure 3) showed extension of vegetation in the RVOT. Vegetation debridement was performed through a longitudinal pulmonary artery incision made above the valvular plane. During the procedure, two pulmonary leaflets were perforated and then promptly repaired. Culturing of the surgical material confirmed *C. albicans* infection.

The patient's recovery was uneventful, and she was discharged from the cardiac intensive care unit on the third day of antifungal treatment. TTE performed on the 14th postoperative day showed a residual small filamentary mobile image on the pulmonary valve with mild pulmonary regurgitation. Due to the poor prognosis of the hematologic disease, the patient was discharged on oral antifungal treatment and continued the chemotherapy cycles after one month.

Discussion

An estimated 5–10% of all IE cases are right-sided.¹ Nonetheless, an increase in the incidence of right-sided IE has been reported due to the global increase in intravenous drug use, greater use of central venous catheters in clinical care, and increased number of cardiovascular implantable electronic devices.² IE is more common in human immunodeficiency virus (HIV)-infected IV drug users than in HIV-uninfected IV drug users as reported by a case-control study in Baltimore (13.8 versus 3.3 cases per 1000 person-years).³ The majority of cases involve the tricuspid valve, with the pulmonary valve accounting for less than 10% of all right-sided cases.⁴

The sensitivity of TTE may be comparable to that of TEE for diagnosing right-sided IE, with a reported sensitivity above 80% among IV drug users.⁵ These results are due to right-sided vegetations being larger anterior structures that are closer to the transthoracic probe than to the transesophageal probe. Furthermore, the drug users are usually younger and have smaller body mass indexes, resulting in good acoustic transthoracic windows. TEE of the pulmonary valve can be challenging, even for experienced echocardiographers, and may have limited optimal visualization. Indications for TEE include a poor acoustic transthoracic window, suspected left-sided endocarditis, suspected pulmonary valve endocarditis, negative TTE and central catheterization results, a poor clinical course with no alternate diagnosis, or relevant or high

Keywords

Endocarditis; Echocardiography, Diagnosis.

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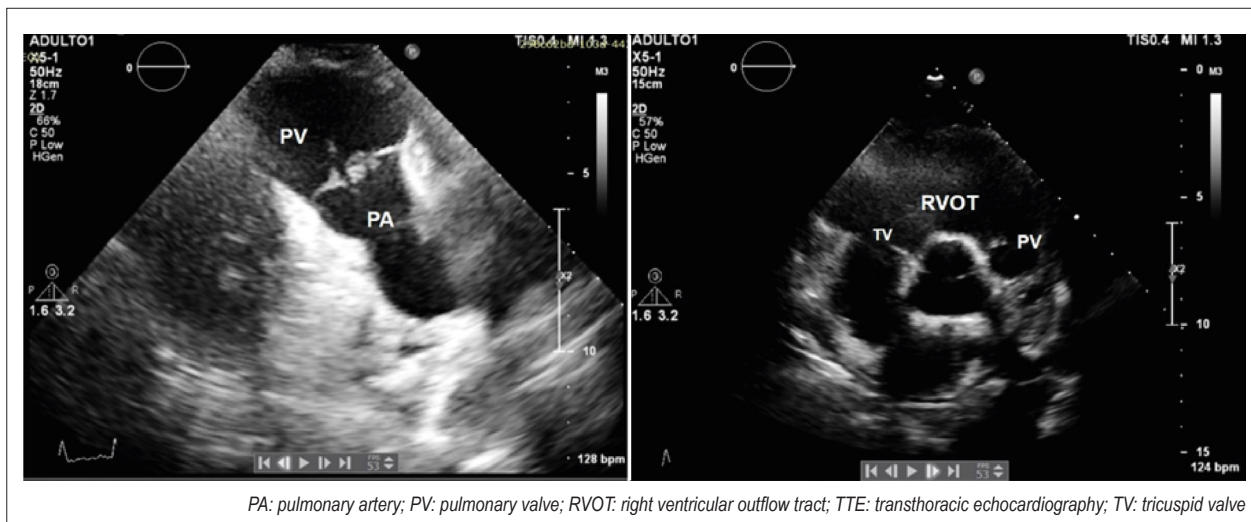
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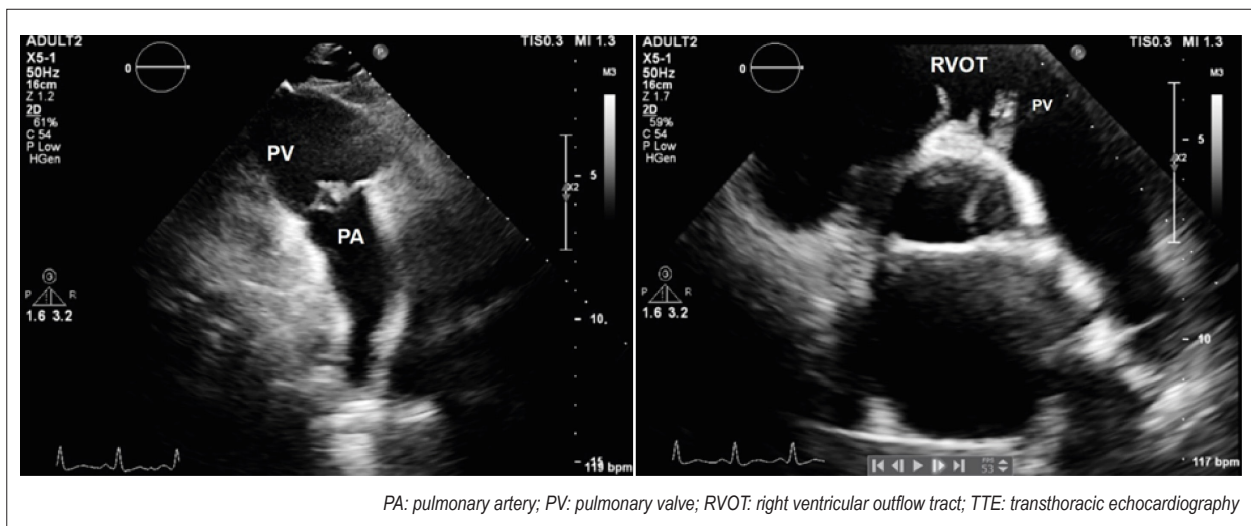


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PA: pulmonary artery; PV: pulmonary valve; RVOT: right ventricular outflow tract; TTE: transthoracic echocardiography; TV: tricuspid valve

Figure 1 – Left panel: TTE parasternal long-axis view of the RVOT showing a vegetation on the pulmonary valve. Right panel: TTE parasternal short-axis view of the RVOT.



PA: pulmonary artery; PV: pulmonary valve; RVOT: right ventricular outflow tract; TTE: transthoracic echocardiography

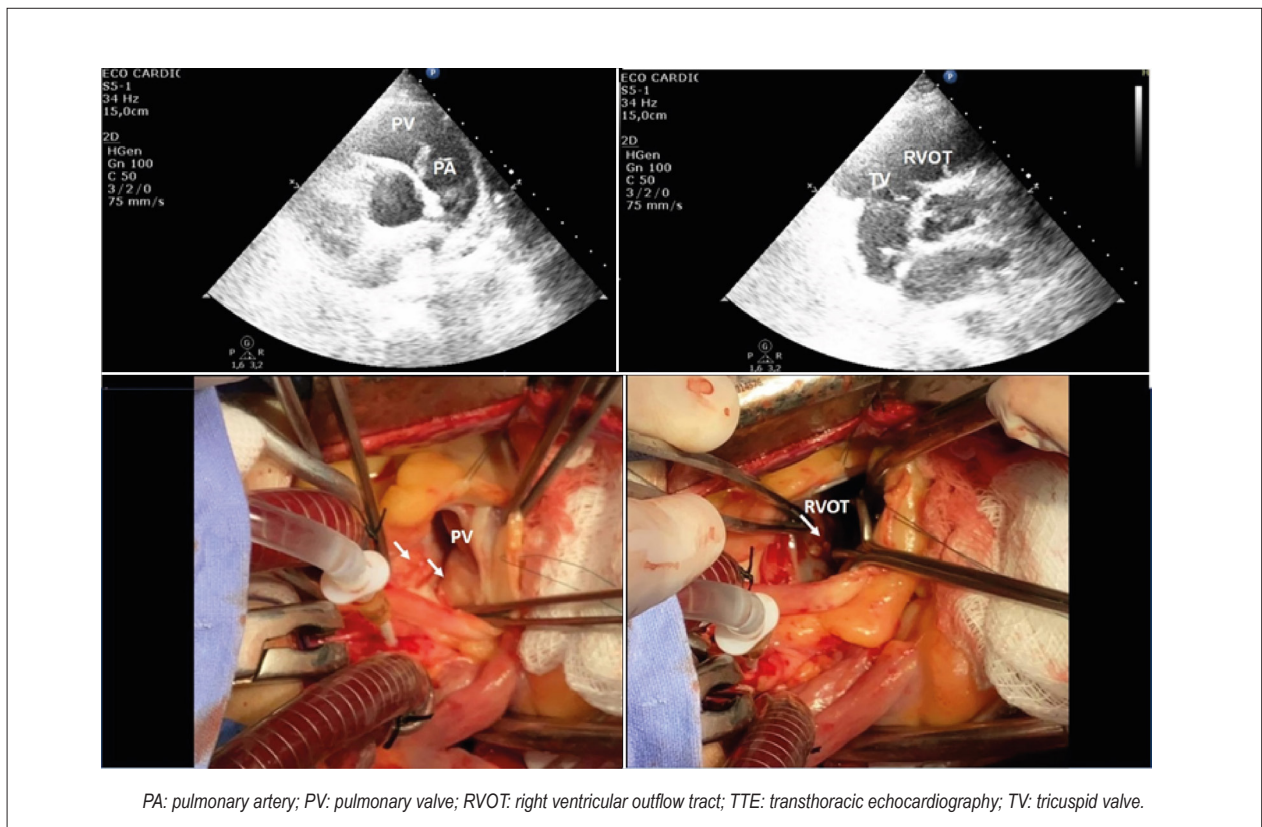
Figure 2 – Left panel: TTE parasternal long-axis view of the RVOT. Right panel: TTE parasternal short-axis view of the right ventricular outflow tract showing a vegetation on the RVOT.

clinical suspicion.⁵ TTE usually provides good visualization of the pulmonary valve cusps as well as the optimal angle for Doppler interrogation. In a published case series, the diagnosis of pulmonary valve IE was made by TTE in all cases.⁶

Surgical intervention is required in 15–30% of patients with right-sided IE,⁷ with a reported operative mortality rate around 7% for patients with isolated tricuspid valve IE.⁸ Surgical indications in right-sided IE were based on an aortic and mitral valve IE population, which had worse prognostic factors including very large vegetations (≥ 2 cm long),⁹ a highly resistant organism and/or persistent bacteremia, recurrent septic pulmonary emboli, and a fungal etiology.¹⁰ The case described here had a clear surgical indication since it was a *C. albicans*-induced IE with persistent bacteremia-like

and septic pulmonary emboli despite antifungal treatment. Adequate surgical techniques include radical debridement of infected tissue and vegetation to preserve the valve,⁶ which is preferred at the early stage of infection; valve repair using autologous pericardium or conserved xeno-pericardium; patching or restoring the valvular cusps¹¹; valve replacement with a conduit; and biological or mechanical prothesis.⁶

Staphylococcus aureus, *Streptococcus* spp., and *Enterococcus* spp. are the most frequent bacteria leading right-sided IE patients to surgical treatment. Fungi were detected in approximately 3% of cases.¹² Factors associated with a poor prognosis included fungal etiology, vegetation size larger than 2 cm, presence of acute respiratory distress syndrome,² and a CD4 count below 200 cells/mm³ in HIV-infected patients.¹³



PA: pulmonary artery; PV: pulmonary valve; RVOT: right ventricular outflow tract; TTE: transthoracic echocardiography; TV: tricuspid valve.

Figura 3 – Upper left panel: TTE parasternal long-axis view of the RVOT. Upper right panel: TTE parasternal short-axis view of the RVOT showing extension of vegetations in the RVOT toward the tricuspid valve. Bottom left panel: surgical view of the pulmonary valve. Bottom right panel: surgical view of the RVOT.

The case presented a difficult and complex therapeutic decision. Although pulmonary valve IE with candidemia and pulmonary septic embolization was a clear surgical indication in this young patient, relapse of acute leukemia *per se* indicated a poor prognosis. Despite the satisfactory surgical outcome in this case, we cannot extrapolate this result to other patients with malignant neoplasia and management decisions should be made on a case-by-case basis.

Conclusion

This was a rare case of pulmonary valve fungal endocarditis in the setting of acute leukemia relapse in a young adult that was managed with surgical resection. This case illustrates the usefulness of TTE in diagnosis, follow-up, and decision-making in right-sided IE. Although we performed TEE, the diagnosis and clinical management could have been made using TTE

alone. Although surgical treatment had a satisfactory outcome in this case, management decisions should be made on a case-by-case basis with multidisciplinary coordination.

Authors contribution

Critical revision for intellectual content and conceptualization: Pianca EG, Branchi MN, Santos ABS; Image acquisition: Pianca EG, Santos ABS; Albrecht AS; Mastella B; Wender OCB. Supervision: Foppa M, Santos ABS; Writing – original draft: Pianca EG; Writing – review & editing: Branchi MN, Albrecht AS, Mastella B, Wender OCB, Foppa M, Santos ABS.

Conflict of interest

The authors have declared that they have no conflict of interest.

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