

Right Ventricular Pseudoaneurysm after Heart Transplantation: a rare complication associated with Endomyocardial Biopsy

Lucas Mollinari Veloso da Silveira,¹^{id} Joana Carolina Junqueira de Brum,¹ Luiz Claudio Danzmann,¹^{id} Diego Costa Cardoso,¹ Estevan Letti,¹ Marcela Cunha Sales,¹ Fernando Antônio Lucchese¹

Santa Casa de Misericórdia de Porto Alegre,¹ Porto Alegre, RS – Brazil

Introduction

Cardiac pseudoaneurysms occur when a rupture in a blood vessel or myocardial wall is contained by surrounding structures such as the pericardium, thrombus, or adhesions. Unlike true aneurysms, pseudoaneurysms are more susceptible to late, potentially fatal ruptures.^{1,2} These lesions most commonly develop as complications of myocardial infarction, typically involving the left ventricle.

Less frequently, pseudoaneurysms can form in the right ventricle due to lipoma, postcardiac surgery, following device lead extraction, in the infectious setting, after remote myocardial infarction, as a complication of endomyocardial biopsy, and after penetrating chest wall trauma.³ The optimal management of right ventricular pseudoaneurysms is not well established, with current strategies focused on preventing rupture.

This report details a case of right ventricular pseudoaneurysm that occurred as a complication of endomyocardial biopsy in a patient during the early postoperative period following heart transplantation.

Case Report

A 47-year-old patient with idiopathic heart failure and combined pulmonary hypertension, responsive to vasodilators, presented with decompensation and required inotropic support. The patient underwent a heart transplant, which was performed without complications, with a total ischemia time of 3 hours and 43 minutes. In the immediate postoperative period, the patient exhibited right ventricular dysfunction and required high doses of Milrinone. A postoperative transthoracic echocardiogram revealed right ventricular dysfunction (FAC 27%) and pulmonary hypertension (SPAP 57 mmHg), with no other significant findings. The recipient had no detectable donor-specific antibodies pre-transplant or during the early postoperative period. Initial rejection surveillance relied on clinical assessment, echocardiography, and laboratory

markers, none of which suggested early rejection. The early right ventricular dysfunction was considered multifactorial. Pre-existing pulmonary hypertension likely contributed to increased right ventricle afterload. Donor-recipient mismatch was excluded based on an appropriate predicted heart mass ratio. The patient progressed favorably with a gradual weaning off inotropic support; however, stimulation with a pacemaker was needed due to sinus node dysfunction, delaying his discharge from the intensive care unit (ICU). The first endomyocardial biopsy was performed on the 14th postoperative day using a rigid biptome through the right internal jugular vein, and the patient was discharged from the ICU thereafter. Biopsy results demonstrated no acute cellular rejection (0R) and no antibody-mediated rejection (pAMR 0), according to the ISHLT classification. On the 16th postoperative day, a follow-up transthoracic echocardiogram showed a right ventricular pseudoaneurysm, located near the outflow tract, measuring 2.5 cm x 2.0 cm, with a rupture orifice of approximately 8 mm and bidirectional flow on color Doppler (Figure 1). The exam also indicated systolic expansion of the pseudoaneurysm. Quantitative parameters of the echocardiogram were: LVEF 77%, FAC 24%, SPAP 63 mmHg. Laboratory markers showed mildly elevated troponin and normal CRP. By that time, immunosuppression of the patient included methylprednisolone followed by prednisone taper, tacrolimus, and mycophenolate mofetil, which may impair tissue healing and favor pseudoaneurysm formation. The patient was on the use of Warfarin, due to a diagnosis of pulmonary embolism. Anticoagulation was stopped upon pseudoaneurysm detection.

After a multidisciplinary discussion, the decision was made to return the patient to the intensive care unit for hemodynamic monitoring, restart Milrinone, suspend the anticoagulation therapy, and proceed with conservative treatment, including serial echocardiograms. Subsequent examinations demonstrated progressive organization of the pseudoaneurysm, with thrombus formation in its lumen and reduction of the rupture orifice. Conservative management was guided by hemodynamic stability, absence of pericardial effusion, a small pseudoaneurysm neck, and elevated surgical risk in the early postoperative immunosuppressed period. ICU monitoring, discontinuation of anticoagulation, and serial echocardiogram every 48–72 hours were adopted as safety measures. An echocardiogram performed on the 56th postoperative day showed no rupture orifice or flow on Doppler in the pseudoaneurysm, indicating complete organization. The patient was discharged from the hospital on the 60th postoperative day and is currently under outpatient follow-up, now 6 months post-surgery. The postoperative course

Keywords

False Aneurysm; Heart Transplantation; Biopsy

Mailing Address: Lucas Mollinari Veloso da Silveira •

Santa Casa de Misericórdia de Porto Alegre - Av. Independência, 75. Postal Code 90020-090, Porto Alegre, RS – Brazil

E-mail: lucasmolinari93@gmail.com

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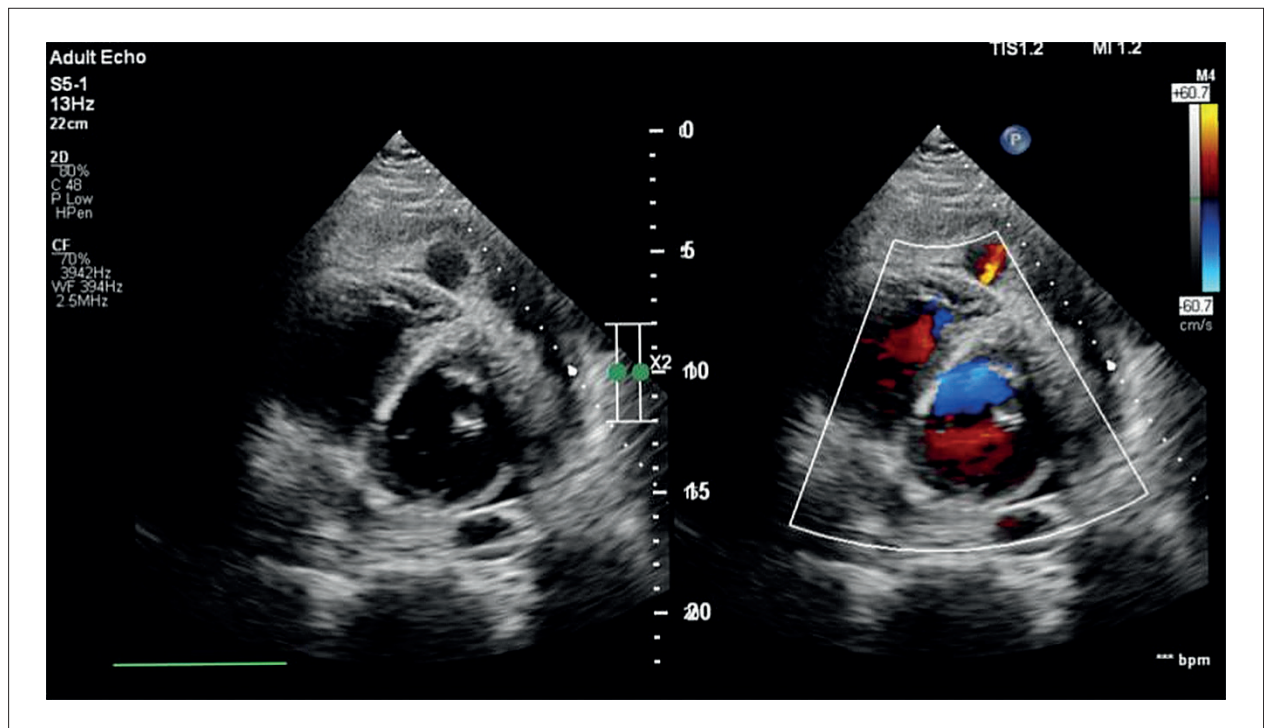


Figure 1 – Echocardiogram showing a right ventricular pseudoaneurysm, located near the outflow tract.

has been favorable, with the patient asymptomatic from a cardiovascular perspective. An echocardiographic control conducted 4 months after surgery showed adequate biventricular function and an organized right ventricular pseudoaneurysm without flow.

Discussion

Pseudoaneurysms of the heart arise from ventricular rupture, are contained by adherent pericardium and fibrotic tissue. They are characterized by the absence of myocardial tissue in their walls, with a narrow neck connecting the ventricle to the paraventricular chamber.⁴ Pseudoaneurysms of the right side of the heart are rare, and most cases are diagnosed incidentally, as the majority of patients remain asymptomatic. Pseudoaneurysm formation may result from either direct perforation during biopsy or microperforation with delayed leak. The absence of acute pericardial effusion and progressive pseudoaneurysm evolution supports the microperforation hypothesis, potentially worsened by corticosteroid immunosuppression in this case.

Endomyocardial biopsy is a routine procedure for monitoring patients who have undergone heart transplantation. Right ventricular perforation is a well-documented complication, often leading to spontaneous closure. However, a minority of patients may develop cardiac tamponade that requires surgical intervention. The formation of a pseudoaneurysm following endomyocardial biopsy is an even rarer complication, with only one other case reported to our knowledge.⁵

Transplanted patients are typically under intense immunosuppression in the days following surgery. It is

speculated that corticosteroids and immunosuppressive medications may delay healing, potentially increasing the risk of pseudoaneurysm formation in this population.

The optimal management of right ventricular pseudoaneurysms remains controversial, with no consensus on the best approach. Management strategies include conservative observation,⁵ percutaneous closure,⁶ and surgical intervention.⁷ The primary goal of any intervention is to minimize the risk of cardiac rupture, as pseudoaneurysms are more prone to rupture than true aneurysms due to the absence of myocardial tissue. Surgical repair is recommended for large pseudoaneurysms or hemodynamic instability; percutaneous closure may be considered in selected anatomies. Conservative treatment is appropriate in small, stable pseudoaneurysms with clear monitoring capacity.

Although this complication has not previously been reported on the right side of the heart, this absence may be attributed to the intrinsically lower intracavitary pressures when compared with the left ventricle, theoretically reducing the risk of rupture and pseudoaneurysm formation. Nonetheless, pulmonary hypertension is relatively common among heart transplant recipients and may elevate right-sided pressures, thereby challenging this rationale and potentially increasing susceptibility to such complications.

No computed tomography (CT) or magnetic resonance imaging (MRI) was performed due to adequate visualization with echocardiogram and the patient's stable condition. Literature suggests CT/MRI are useful for structural delineation, but the echocardiogram remains the primary follow-up modality in right ventricle pseudoaneurysms.

Considering the high risk of surgical complications associated with the postoperative period and the use of immunosuppressants, we opted for a conservative management strategy involving intensive monitoring and continuous reassessment of the patient.

Our case shares important parallels with the seminal report by Rodrigues et al. in 1995,⁵ which first described a right ventricular pseudoaneurysm following endomyocardial biopsy after heart transplantation. As in that initial case, microperforation in the context of early postoperative immunosuppression likely contributed to delayed myocardial healing and subsequent pseudoaneurysm formation. However, the structured contemporary management employed here—featuring intensive hemodynamic monitoring, withdrawal of anticoagulation, optimization of right ventricular unloading, and systematic serial echocardiography—reflects significant advances in the clinical approach to this rare complication. The complete spontaneous organization of the pseudoaneurysm supports the notion that, in carefully selected and hemodynamically stable patients, conservative management remains a safe and effective strategy. This case thereby reinforces and updates the observations from the 1995 report, contributing to the modern context of an exceedingly uncommon postoperative event.

In this report, we describe a rare complication following a routine procedure after heart transplantation that was successfully managed conservatively. Limitations include the absence of multimodality imaging and relatively short follow-up (6 months), preventing assessment of late progression. We

hope that this case will contribute to the existing literature and provide guidance for future cases.

Author Contributions

Conception and design of the research: Silveira LMV, Brum JCJ, Danzmann LC; Acquisition of data: Silveira LMV, Brum JCJ, Cardoso DC, Letti E; Analysis and interpretation of the data: Silveira LMV, Brum JCJ; Writing of the manuscript: Silveira LMV; Critical revision of the manuscript for intellectual content: Silveira LMV, Brum JCJ, Danzmann LC, Cardoso DC, Letti E, Sales MC, Lucchese FA.

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Ethics approval and consent to participate

This article does not contain any studies with human participants or animals performed by any of the authors.

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