

Case Report

Percutaneous Closure of Ventricle Pseudoaneurysm—A Complication of Endomyocardial Biopsy in a Pediatric Heart Transplant Recipient: A Case Report

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A pseudoaneurysm of the heart forms when the ventricular wall perforates and is surrounded by a pericardial lamina. This condition is a rare but potentially life-threatening complication of intracardiac procedures. Endomyocardial biopsy is a safe diagnostic method; however, a small percentage of patients suffer complications, such as perforation of the cardiac wall. This report details the percutaneous management of a pseudoaneurysm following endomyocardial biopsy after orthotopic heart transplantation.

Endomyocardial biopsy (EMB) is considered the gold standard for the diagnosis and monitoring of acute rejection in heart transplant recipients.¹ The protocol of performing EMBs after orthotopic heart transplantation (OHT) varies. At our institution, 6 EMBs are performed in the first year after OHT, followed by yearly procedures thereafter. Previously, 8 EMBs were conducted during the first year. Cardiac perforation, as a complication after EMB, occurs in 0.9% procedures among the pediatric population.² As surgical management is a preferable way to supply this complication, a percutaneous pathway could be beneficial.

Case Description

A patient with familial hypertrophic cardiomyopathy was diagnosed at age 7 years. At age 10 years, signs of heart failure and several episodes of syncopes during slight physical exertion were noted. Echocardiographic examinations showed increasing myocardial hypertrophy of both ventricles (up to 350 g of left ventricular (LV) mass; z-score, + 12.9), resulting

in a restrictive inflow and enlargement of both atria. Magnetic resonance imaging confirmed hypertrophic cardiomyopathy and showed signs of LV muscle fibrosis. The patient had an implanted cardioverter-defibrillator for primary prevention of sudden cardiac death.

At age 15 years, due to the further development of circulatory failure, the patient qualified for OHT and underwent OHT after 5 days. The postoperative course was uneventful. Numerous follow-up examinations showed normal function of the transplanted heart, with no symptoms of cellular rejection in 6 following control EMBs. After 5 months, the next EMB was performed in a routine way, from the femoral approach, and with no signs of rejection (0 International Society for Heart and Lung Transplantation). After the procedure, a small amount of fluid was observed in the apical area of the pericardial sac. In the following days, echocardiographic examination revealed slow but constant progression of fluid accumulation in the restricted area of pericardium, with maximum size of 16 x 43 mm, with narrow communication with the right ventricle (RV), but with no signs of tamponade (Fig. 1A). The patient complained of mild chest pain and easy fatigue; however, vital signs were normal, without anemia.

Due to the progressively increasing amount of fluid, the heart team qualified the child for transcatheter closure of the pseudoaneurysm entrance under surgical backup, and in the case of lack of success, for its surgical closure. The procedure was performed under general anesthesia with intubation, via the right femoral vein. Ventriculography confirmed a pseudoaneurysm originating in between the RV apex trabeculations to the pericardial recess, with dimensions of 40 x 25 mm. The Judkins Right 6F catheter (Cordis Corp, Johnson & Johnson, New Brunswick, NJ) was inserted successfully along the coronary guidewire through the opening into the pericardial pseudoaneurysm (Fig. 1B, see [Supplementary Videos](#)). As the minimal dimension of the long entrance to the recess was 2.5 mm, the Amplatzer Duct Occluder II, 4 x 6 mm (ADO II), (Abbott Laboratories, Green Oaks, IL) was chosen, as it has

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See page 102 for disclosure information.

Novel Teaching Points

- Endomyocardial biopsy potentially could cause a cardiac wall perforation with following tamponade or pseudoaneurysm formation.
- Pseudoaneurysm size can increase gradually; thus, close follow-up care is advised.
- RV pseudoaneurysm can be closed safely using the percutaneous approach.

fairly big 10-mm retention discs on both sides. Then, the catheter was exchanged for a 4F dedicated delivery sheath, and the device was introduced. The distal retention disc was released inside the pericardial space, the middle part, and the proximal disc—in the fistula lumen. Tight closure was achieved, and the procedure was uneventful. Follow-up ultrasound examinations confirmed that the procedure and fluid withdrawal had a good effect. During the 3-year follow-up, 4 further follow-up EMBs were performed, without any complications.

Discussion

Although endomyocardial biopsy is recognized as a safe and irreplaceable method for detecting acute rejection of OHT, a number of patients may develop complications. The profits of EMB certainly outweigh the potential risks. Bermpeis et al. reported that post-OHT EMBs were associated with the highest complication rate. The study showed that LV biopsy had a greater complication risk compared with that of RV biopsy (6.4% vs 3.8%), but it simultaneously had a higher risk of a new pericardial effusion after RV biopsies (2.1% vs 0.4%).³ In particular cases, the perforation may not cause tamponade, but it may become surrounded by the parietal pericardium and thrombus, resulting in the formation of a pseudoaneurysm. Postoperative adhesions can contribute to the formation of a pseudoaneurysm, as observed in the patient discussed. A pseudoaneurysm has the potential to rupture, which is life-threatening. Frances et al. shows that death due to LV pseudoaneurysm occurs in 3% of cases. Also, the surgical

management of aneurysms carries significant risk, with an associated mortality rate of 9%.⁴ The use of RV, instead of LV, biopsy, and the fact that it was the seventh EMB in a fairly short period of time, are the speculative risk factors for any complication of EMB in the presented case.³ Percutaneous closure of perforations within the myocardium rarely is reported. Only a few case reports have been made of percutaneous closure of RV perforations using various devices. Zipse et al. described the closure of an RV perforation caused by an ablation catheter using an Amplatzer septal occluder (Abbott).⁵ Saxena et al. reported that the use of an ADO II device for percutaneous closure of RV perforation inadvertently performed during pericardiocentesis.⁶ Closure of the LV perforation also was described. Bhatia et al.⁷ reported a case of emergent percutaneous closure of LV free wall perforation during transcatheter aortic valve replacement using the Amplatzer Muscular VSD Occluder device (Abbott Laboratories, Green Oaks, IL). The location and relatively narrow diameter of the presented perforation allowed use of the ADO II device for closing the pseudoaneurysm and avoiding redo surgery. The risk of coronary artery compression by the device was negligible due to the pseudoaneurysm morphology and the apical localization.

Conclusions

The EMB is a safe procedure; however, cardiac perforation is its most known major complication. Some of those perforations can form the ventricle pseudoaneurysm. Due to its nonacute nature, some of them potentially can be closed percutaneously.

Ethics Statement

The research reported has adhered to the relevant ethical guidelines.

Patient Consent

The authors confirm that patient consent is not applicable to this article. This case report uses de-identified data;

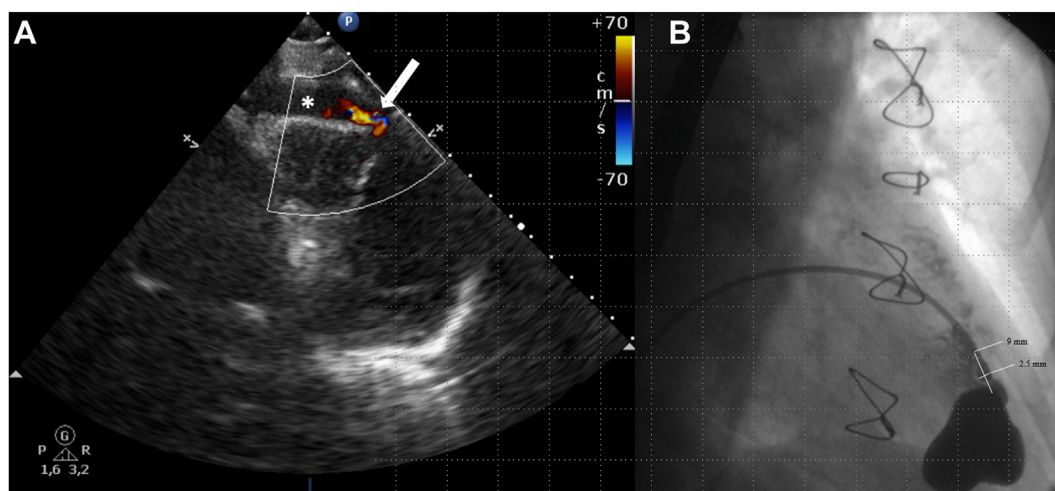


Figure 1. (A) Echocardiographic image of right ventricle pseudoaneurysm. The * shows the pseudoaneurysm; arrow shows its entrance. (B) Pseudoaneurysm of the right ventricle imaged in angiography with its sizes.

therefore, the institutional review board did not require consent from the patient.

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Disclosures

The authors have no conflicts of interest to disclose.

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