Successful Pulmonary Thromboendarterectomy for Right Atrial Thrombosis in a Heart Transplant Recipient: A Case Report

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Acute massive or submassive pulmonary embolism is a life-threatening condition with a poor prognosis. It causes sudden hemodynamic deterioration and warrants immediate surgery. We report the case of a 41-year-old male heart transplant recipient who had not been treated prophylactically for thrombosis, who was referred to our center because of exertional dyspnea after immobilization owing to an injury in one of his legs. Transesophageal echocardiography revealed a large, mobile, right atrial mass originating from a pacemaker lead. Furthermore, contrast-enhanced computed tomography scanning of the chest revealed multiple pulmonary emboli resulting in subtotal occlusion of both pulmonary arteries. Although typically reserved for patients with chronic thromboembolic pulmonary hypertension, surgical thromboendarterectomy was successfully performed. Six months after discharge, the patient is well and has a New York Heart Association class 1 rating. This is the first report of a successful pulmonary thromboendarterectomy in a heart transplant recipient.

Key words: *Thromboembolism, Immunosuppression, Thrombose prophylaxis, Pacemaker, Endartectomy*

Despite tremendous advances in the medical management of end-stage heart failure, the gold standard for treating congestive heart failure remains the cardiac transplant. Optimal outcome after heart transplant can only be obtained if patients are supported in adhering to a therapeutic regimen consisting of a lifelong medication regimen that includes taking immunosuppressive drugs, avoiding cardiovascular risks, monitoring for signs and symptoms of complications, and attending regular clinical checkups. Therefore, patient-physician cooperation is crucial for a successful outcome. Patients who have undergone a transplant, especially those who have received a pacemaker, should be given a strict thrombosis prophylaxis regimen after immobilization administered by the general practitioner.

Acute pulmonary embolism (PE) has a mortality rate of 15% at 3 months [1]. For patients with chronic thromboembolic pulmonary hypertension, bilateral pulmonary thromboendarterectomy (PTE) is the first choice of treatment. Even with the options of anticoagulation and thrombolysis, PTE is suggested for patients with acute, massive PE complicated by cardiogenic shock. After PTE, 93% of patients improve their New York Heart Association class rating to 1 or 2 [2]. We report a heart transplant recipient with numerous emboli in both pulmonary arteries (presumably associated with a large thrombus originating from a right atrial pacemaker lead after a short immobilization period without thrombosis prophylaxis) who was treated with PTE.

Case Report

A 41-year-old man who had undergone an orthotopic heart transplant and implantation of a DDD pacemaker (Medtronic Kappa, Medtronic GmbH, Düsseldorf, Germany) in 2002 was admitted to our center owing to a suspected rejection episode. Anamnesis and physical examination revealed that for 2 weeks prior to admission, the patient had had dyspnea (which significantly limited daily activities) and lower extremity edema. The clinical history also included a short period (48 hours) of immobilization after a limb injury without thrombosis prophylaxis. At admission, his immunosuppressive regimen consisted of 1 mg tacrolimus combined with 1 mg

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Figure 1A. Transesophageal echocardiogram (longitudinal plane) showing the size of the thrombus (arrowhead; LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle; T, thrombus). A prolapse of the atrial mass into the right ventricle is displayed.

Figure 1B. Transesophageal echocardiogram (transverse plane, 4-chamber view) revealing a large thrombus in the right atrium during diastole, which impends the tricuspid valve. The contours of the thrombus are shown by the arrowheads (LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle; T, thrombus).

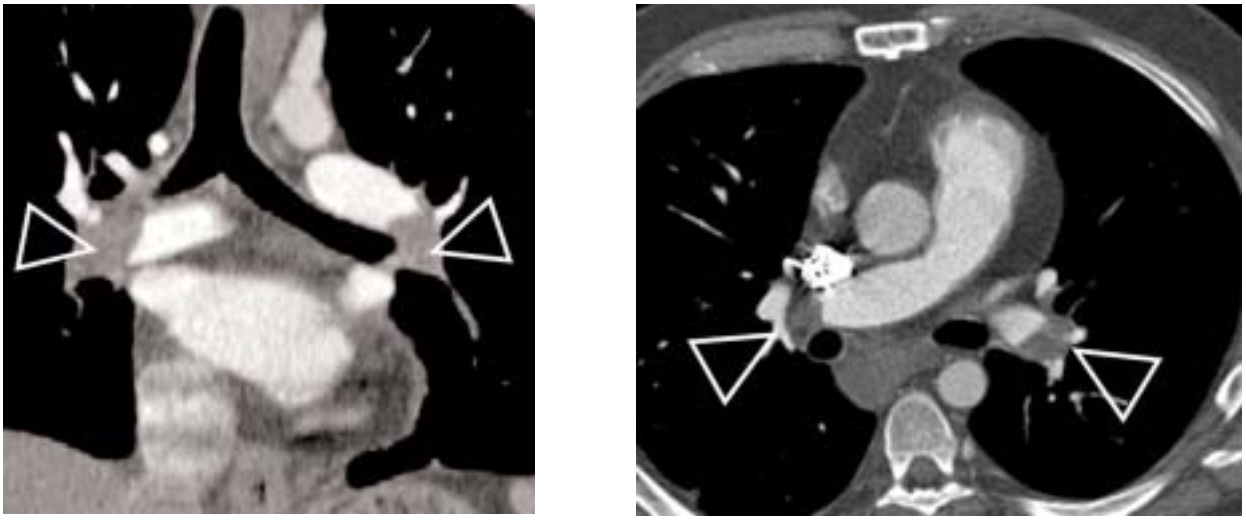

Figure 2A-2B. A 16-row multidetector computed tomography angiography of the pulmonary circulation was obtained. Coronal (Figure 2A) and transverse (Figure 2B) reconstructions show homogeneous enhancement of the pulmonary arteries. Central massive emboli are displayed in the left and right main pulmonary arteries (arrowheads).

sirolimus daily. Trough levels on admission were 4.0 ng/mL for sirolimus and 4.4 ng/mL for tacrolimus. Because allograft rejection was first suspected, we immediately performed a transthoracic echocardiography, which detected a floating mass (originating from a pacemaker lead in the right atrium) that had prolapsed into the right ventricle trough the tricuspid valve during diastole. Additionally, the right ventricle showed severe dilation (Figures 1A and B). Multidetector computed tomography angiography with intravenous contrast was performed to evaluate a suspected PE. The examination showed multiple recent and older emboli in the pulmonary arteries, leading to subtotal occlusion of both pulmonary arteries (Figures 2A and B). Because of the patient's critical state, thrombolytic treatment was not considered. Moreover, venous ultrasonography of the leg and pelvic veins provided no evidence of deep venous thrombosis. We decided to perform an immediate PTE owing to imminent hemodynamic deterioration due to the acute massive pulmonary artery thromboembolism.

After introduction of general anesthesia, we performed a median sternotomy. The patient was heparinized and cannulated for cardiopulmonary bypass (CPB). After CPB had been installed, the right atrium was opened, and a 3 × 5 cm compact clot, which surrounded both pacemaker leads, was revealed. The adherent right atrial thrombus was removed together with the pacemaker leads and the pacemaker aggregate. Both pulmonary arteries were inspected and the emboli found to be organized and

adherent so that the pulmonary trunk was sutured. The patient's body temperature was cooled to 16°C, and CPB was stopped, arresting bronchial blood flow for optimal visibility. The right pulmonary artery was opened, the embolus and the other thrombotic material were dissected, and the artery was closed. After 20 minutes of circulatory arrest, we resumed circulation for 20 minutes. In the next step, we stopped CPB again, repeating the same procedure for the left pulmonary artery. Following bilateral endarterectomy, we restarted circulation and rewarmed the patient. Weaning of CPB was uneventful. The postoperative period also was uneventful. After recovery and normalization of C-reactive protein and leukocyte levels, a transvenous DDD-pacemaker (Verity ADx XL DR 5356, St. Jude Medical, Eschborn Germany) was reimplanted. Three weeks after surgery, the patient was discharged on phenprocoumon with a goal international normalized ratio ranging from 2.0 to 3.0. At the time of this writing, 6 months after discharge, the patient has a New York Heart Association rating of class 1 and is doing well.

Discussion

We report the first successful PTE in a heart transplant recipient. PTE was combined with dissection of a right atrial thrombus that had attached to pacemaker leads and pacemaker explantation. Halting clot propagation, preventing early and late recurrence of a PE, as well as averting pulmonary hypertension are the initial goals of treating PE. These goals usually are achieved with anticoagulation and thrombolysis [3]. PTE traditionally has been reserved as the first choice for treating patients with chronic thromboembolic pulmonary hypertension. But PTE also may be appropriate in patients with life-threatening, massive PE complicated by cardiogenic shock. Recently, Jamieson and colleagues presented the results of a study of 1500 patients who had undergone PTE and had been followed up for 6 years; the authors found a mortality rate of 7.5% and a survival rate of 75% [2]. In another study by Lund and colleagues that compared treatment of PE with full-dose heparin, streptokinase, or embolectomy, the authors concluded that pulmonary embolectomy should be recommended for all patients with emboli localized in the main branches of the pulmonary artery [4].

In the current patient, owing to the imminent hemodynamic deterioration caused by the acute massive pulmonary artery thromboembolism and the accompanying severe thrombosis of the pacemaker leads in the right atrium, we decided to perform an immediate PTE. The formation of thrombi on permanent pacemaker leads represents an infrequent complication of cardiac pacing. In a 10-year analysis of 2621 patients who had received pacemaker implantation or replacement, Harcombe and colleagues detected no thromboembolic complications [5]. Although thromboembolic complications due to pacemaker leads are rare, it is important to be aware of such complications when a patient presents with symptoms of congestive heart failure, dyspnea, syncope, or PE, as these symptoms are associated with a high mortality rate [6]. Regarding treatment of a right atrial thrombus, there is no gold standard. Goldhaber and colleagues described a case in which infusion of urokinase was successful in treating a right atrial thrombus [7], but there also are instances of unsuccessful thrombolytic treatment followed by surgery [8].

This case highlights the fact that PTE may be performed safely in a heart transplant recipient. This case also demonstrates that a rapid diagnosis may be crucial for a favorable result. We also want to emphasize that in patients who have received transplants, especially those with a pacemaker, thrombosis prophylaxis following immobilization owing to a limb injury is recommended.

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