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CASE REPORT

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Biventricular thrombosis and survival after two different mechanical supports before heart transplantation

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Abstract

Patient survival from biventricular thrombosis is possible using mechanical support followed by cardiac transplantation.

KEYWORDS

Cardiac thrombosis, cardiac transplantation, extra-corporeal membrane oxygenation, ventricular assist-device

1 | INTRODUCTION

A 25-year-old patient with aortic dissection develops intracardiac thrombosis following a Bentall procedure. He was initially supported using extra-corporeal membrane oxygenation then by a total artificial heart. He was finally transplanted and recovered completely. Biventricular intracardiac thrombus are rare in cardiac surgery and are fatal. A successful approach is described.

Thoracic aortic emergencies carry a high in-hospital mortality rate, especially if their initial presentation is in an unstable hemodynamic state.[1] The diagnosis can be challenging because of its similarity with acute coronary syndromes. We present a patient with acute aortic syndrome complicated by profound myocardial dysfunction and biventricular thrombosis which are typically fatal. The patient required two different types of circulatory support followed by successful cardiac transplantation and discharge to the hospital.

2 | CASE REPORT

A 25-year-old man presents to the emergency department with 12 hours of precordial discomfort and dyspnea. His vital signs were 132/76 mm Hg of blood pressure, 98 beats per minute of heart rate, 28 cycles per minute of respiratory rate, and no fever was found. The physical examination was normal. He has no significant past medical history. The electrocardiogram showed nonspecific ST segment abnormalities and the troponin assay value was elevated. Initially a non-ST elevation of myocardial infarction was diagnosed, and the patient received aspirin, ticagrelor, and intravenous heparin. Although the patient presented a severe angina-like persistent chest pain, a computed tomography scan (CT-Scan) of the thorax was performed. The scan revealed an aortic emergency that was not suspected initially based on clinical presentation. The CT-Scan showed a large ascending aortic aneurysm of 12.8 cm originating from the aortic valve up

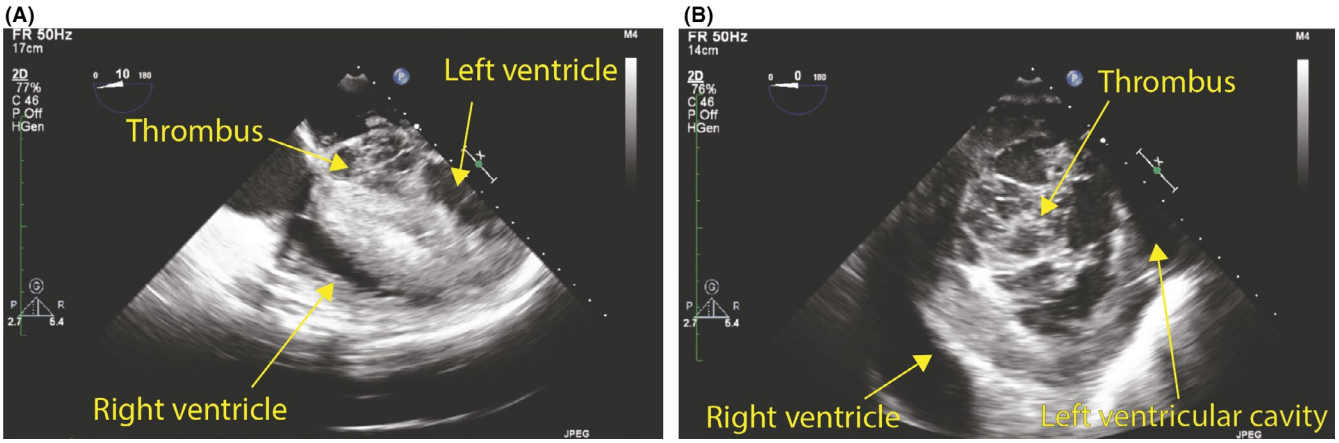

FIGURE 1 A. Transesophageal echocardiographic (TEE) mid-esophageal four-chamber view showing intraventricular thrombi. B. TEE transgastric view showing intraventricular thrombi

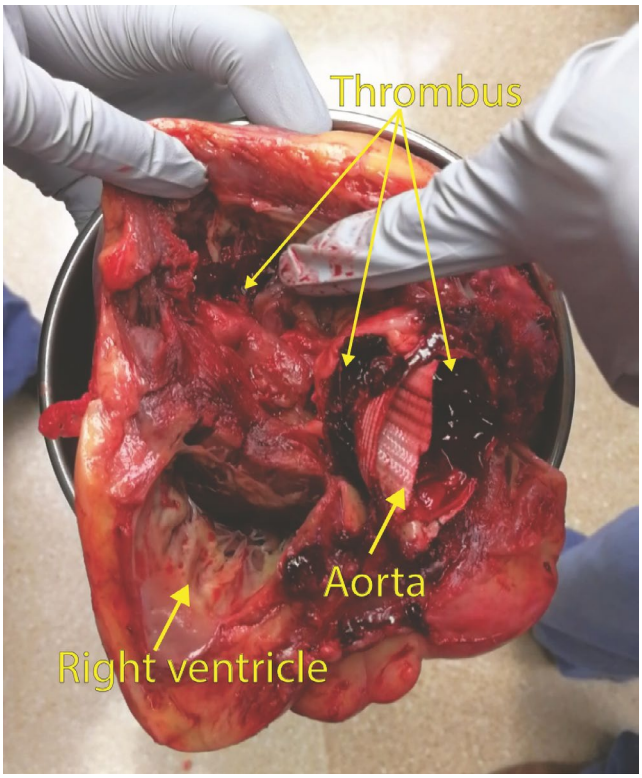

FIGURE 2 Aortic prosthesis and biventricular thrombi on the explanted heart

to 7.5 cm before the brachio-cephalic trunk associated with right coronary artery compression. An echocardiogram also showed a severe aortic regurgitation. The patient was transferred to a tertiary cardiac surgery center. A preoperative transesophageal echocardiogram (TEE) confirmed the diagnosis of bicuspid aortic valve, aortic aneurysm with severe regurgitation, a left ventricular ejection fraction of 20%, and a doubt on the presence of an intimal flap and he underwent a Bentall procedure. This procedure consists of the replacement of the aortic valve, aortic root, and ascending aorta by a mechanical valve conduit with the reimplantation of the coronaries. During the surgery, massive surgical bleeding required massive transfusion. The patient remained in cardiogenic shock and could not have been weaned off cardiopulmonary bypass. A peripheral veno-arterial extra-corporeal membrane oxygenation system (VA-ECMO) was inserted because of the refractory shock and the patient was transferred to the intensive care unit with active bleeding, no heparin infusion, and continuous veno-veno hemofiltration. Six hours later, the patient was explored for surgical hemostasis. Heparin infusion was started 4 hours later, once mediastinal bleeding was minimal. Two hours later, a TEE showed large biventricular thrombi (Figure 1A-B and Video S1) and a mechanical aortic valve prosthesis thrombosis with extension in the ascending aorta prosthesis. He was then transferred to a heart transplant center. A normal head CT-Scan encouraged further aggressive care, even though the patient has multiorgan failure. Three days later, a total artificial heart was inserted (Cardiowest, Syncardia, Tucson AZ, USA) following total heart explantation and great vessels thrombectomy was performed (Figure 2).

3 | DISCUSSION

The courses of action and the survival of a patient following aortic surgery, VA-ECMO, cardiac thrombosis, artificial heart implantation, and heart transplantation have never been reported. The mortality rate of aortic emergencies remains high, because of delay in presentation and misleading differential diagnosis such as acute coronary syndromes. The delay to treat an aortic dissection has a 1% mortality per hour in the first 48 hours [2] and urgent aortic surgeries are associated with a high mortality.

Before implanting an artificial heart, not available in the reference center, a VA-ECMO was used to support the patient. VA-ECMO has become an option to recovery of cardiopulmonary function while maintaining organic perfusion

and is increasingly used around the world. The survival of VA-ECMO in the postcardiotomy setting is lower than in other setting and is around 30%. VA-ECMO may be complicated by thrombosis and does not prevent systemic embolism. Once the thrombus is in place, the risk of cerebral, renal, mesenteric, and distal extremity embolization remains high. Postmortem examinations showed thrombotic complications in 24 of 59 cases.[3] Proposed mechanisms are low flow state leading to intracardiac blood stasis, foreign surface contact, proinflammatory state, and massive transfusion. Biventricular thrombi were also reported previously in other types of conditions such as myocardial infarction, stress (Takotsubo) myocardiopathy, nonischemic cardiomyopathies, peripartum, myocarditis and is associated with human immunodeficiency virus. Intracardiac biventricular thrombus are typically associated with poor outcome.

Because of the age of the patient and the absence of previous extracardiac comorbidities, a total artificial heart as a potential bridge to cardiac transplantation was considered to let the patient recover end-organ damages and for further transplantation. The insertion of a total artificial hearts has been reported in the literature with a mortality in the first year of 59%[4] and 44% in our center.[5] The patient suffered from multisystem organ dysfunction, but management with artificial heart support, renal replacement therapy, and time led to a successful recovery. He was finally transplanted forty days later and discharged home alive without neurologic damage and with a normal renal function.

In summary, we present a patient with two types of hemodynamic support before heart transplantation. First, support with VA-ECMO due to biventricular failure post-cardiotomy, then a total artificial heart following biventricular and prosthetic aortic valve thrombosis and finally cardiac transplantation.

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Published with written consent of the patient.

CONFLICT OF INTEREST

Dr Denault is on the Speakers Bureau for CAE Healthcare, Masimo and Edwards, and he received a grant from Edwards. The other authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTIONS

JPRB: This author helped with the conception and design of the work, the acquisition, analysis and interpretation of data for the work, and revising it critically for important intellectual content. AC: This author helped with the conception and design of the work, the acquisition, analysis and interpretation of data for the work, and revising it critically for important intellectual content. YTS: This author helped with the conception and design of the work, the acquisition, analysis and revising it critically for important intellectual content. FMC: This author helped with the conception and design of the work, the acquisition, analysis and interpretation of data for the work, and revising it critically for important intellectual content. AYD: Corresponding author who helped with the conception and design of the work, the acquisition, analysis and interpretation of data for the work, and revising it critically for important intellectual content. All authors gave final approval of the version to be published; and all authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy of integrity of any part of the work are appropriately investigated and resolved.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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