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CASE REPORT
Heart failure

Constrictive pericarditis after heart transplantation: a case report

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Background Constrictive pericarditis (CP) is a disease characterized by inflammation, progressive fibrosis, and thickening of the pericardium. Constrictive pericarditis after heart transplantation (HT) is a rare phenomenon, with a reported incidence of 1.4–3.9%. It is an important clinical problem which shares similar clinical features with entities such as restrictive cardiomyopathy. Therefore, it poses diagnostic challenges and therapeutic dilemmas even for experienced clinicians.

Case summary A 53-year-old patient developed a zoster infection with pericardial effusion 9 months after HT for idiopathic dilated cardiomyopathy. Two months later, he presented with leg oedema and ascites and was treated by diuretics for volume overload. He was readmitted 8 months later with features of right heart failure. Multimodal imaging investigations were suggestive of CP. He successfully recovered after a radical pericardiectomy.

Discussion Constrictive pericarditis is a rare complication in HT. Heart transplant recipients (HTR) with a history of post-operative pericardial effusion, or with rejection episodes are at high risk of developing CP. Differentiating CP from other conditions that cause apparent congestive heart failure in HTR is challenging. Management of CP is mainly surgical pericardiectomy.

Keywords Case report • Pericarditis • Pericardial effusion • Constrictive pericarditis • Heart transplantation

Learning points

- The diagnosis of constrictive pericarditis should be considered in heart transplant recipients with symptoms of congestive heart failure, and who have a preserved systolic ventricular function.
- Heart transplant recipients with a history of post-operative pericardial effusion or with rejection episodes are at high risk of developing constrictive pericarditis.

Introduction

Constrictive pericarditis (CP) is a disease characterized by inflammation, progressive fibrosis, and thickening of the pericardium. Constrictive pericarditis may follow any cardiac surgical procedure, with an incidence rate varying from 0.1% to 0.3%.[1,2] Constrictive pericarditis after heart transplantation (HT) is a rare phenomenon. During the past decades, rare cases of CP have been reported after

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HT.[3–13] Herein, the authors present the case of a patient who developed CP 19 months after HT.

Timeline

Time	Events
Day 0	Orthotopic heart transplantation (HT) for idiopathic-dilated cardiomyopathy.
9 months Post-HT	Herpes zoster virus infection treated by intravenous acyclovir. Asymptomatic pericardial effusion. Normal right heart catheterization.
11 months Post-HT	Readmitted for peripheral oedema, and ascites. Bilateral pleural effusion and small-sized pericardial effusion on echocardiogram and chest computed tomography. No echocardiographic signs of constriction. Normal left ventricular ejection fraction. Normal right heart catheterization. Diagnosis of volume overload treated by diuretics.
19 months Post-HT	Readmitted for dyspnoea, peripheral oedema, and ascites. Multimodal imaging evidence of constrictive pericarditis. Right heart catheterization: 'square root sign', prominent x and y descent on the right atrial pressure tracing. Right atrial pressure: 15 mmHg, pulmonary artery pressure: 33/15 mmHg (mean 22 mmHg), pulmonary capillary wedge pressure: 18 mmHg. Successfully underwent pericardiectomy.
23 months Post-HT	The patient is asymptomatic with echocardiogram showing normal ventricular function and filling pressures.

Case presentation

A 53-year-old man with idiopathic dilated cardiomyopathy underwent a bicaval orthotopic HT. His previous medical history at the time of transplant included atrial fibrillation and amiodarone-induced hyperthyroidism. He was a tobacco smoker but had quit 1 year prior to the HT. Post-operative complication included a second-degree atrioventricular block requiring the implantation of a permanent dual-chamber pacemaker.

The patient received a triple-drugs immunosuppressive regimen with oral corticosteroids (Prednisone), a purine synthesis inhibitor (Mycophenolate mofetil), and a calcineurin inhibitor (Tacrolimus).

Approximately 9 months post-operatively, the patient was admitted in our centre for the appearance of painful vesicular rashes on the head, thorax, and abdomen. The patient had no chest pain, nor dyspnoea. Electrocardiogram showed a normal sinus rhythm. Echocardiography and chest computed tomography (CT) scan showed a moderately sized pericardial effusion (PE) with no haemodynamic changes (*Figure 1*). The virological test performed on Day 2 revealed a varicella zoster (VZV) (Enzyme immunoassay, IgG) titer of 2157 mU/mL, while the level of VZV IgM was not significant. The Tzanck test was positive for herpes zoster virus infection. He was treated with intravenous Acyclovir during 10 days.

Two months later, he presented with leg oedema and ascites. Echocardiogram and cardiac CT scan showed a small-sized (<10 mm) localized PE with bilateral pleural effusion (*Figure 1*). The left ventricular systolic function was normal with an ejection fraction of 70%. The filling pressures were low, and the pericardium was slightly thickened but the image was stable compared to previous examinations (*Figure 1*). He underwent pleurocentesis. Myocardial biopsy showed no evidence of rejection. Right heart catheterization was normal at that time. He presented a decreased renal function, Creatinine 2.2 mg/dL (0.73–1.18 mg/dL) or 194.48 µmol/L (64.6–104.4 µmol/L), with a normal albumin blood level, and no proteinuria. He was successfully treated by diuretics for volume overload without a clearly defined aetiology.

Approximately 19 months post-operatively, the patient presented exertional dyspnoea. Upon admission, his blood pressure was 100/60, heart rate 85 b.p.m., respiratory rate 20 breaths per minute, oxygen saturation 96% on room air. He was afebrile. Physical examination revealed lower extremity oedema and abdominal distention. There were reduced breath sounds at the lung bases. No neck veins distention, nor heart murmurs were noticed. Laboratory investigations revealed a normocytic anaemia; haemoglobin of 9.9 g/dL (13.3–17.2 g/dL) or 6140 µmol/L (8250–10 670 µmol/L); and a known chronic kidney disease, Creatinine at 2.13 mg/dL (0.73–1.18 mg/dL) or 188.4 µmol/L (64.6–104.4 µmol/L), and a glomerular filtration rate of 33 mL/min (normal >60 mL/min). Echocardiography revealed a thick pericardium overlying the right atrium and right ventricle with the preserved systolic function of both ventricles. Echocardiography also showed several diagnostic elements that demonstrate a CP: septal bouncing in a four-cavity apical view, respiratory variation of the E wave of the mitral flow greater than 25% with a deceleration time of less than 160 ms, respiratory variation of the tricuspid E wave of more than 40% with a deceleration time of less than 160 ms, and high velocity of the mitral ring (greater than 8 cm/s) (*Figure 2*). Right heart catheterization demonstrated classical 'square root sign' which illustrates the elevation of end-diastolic filling pressures, and a prominent x and y descent on the right atrial pressure tracing (*Figure 3A, B*). The exam also revealed a right atrial pressure of 15 mmHg, a pulmonary artery pressure of 33/14 mmHg (mean 22 mmHg), and a pulmonary capillary wedge pressure of 18 mmHg. A cardiac CT scan confirmed significant regional pericardial thickening of up to 4 mm with bilateral pleural effusion (*Figure 4*).

Myocardial biopsy showed no evidence of rejection.

The patient underwent repeat median sternotomy and phrenic-to-phrenic pericardiectomy under central cardiopulmonary bypass. Intraoperative findings included a thickened pericardium and a dense epicardial peel over the right atrium and both ventricles (*Figure 5*). Pathological examination of the pericardial tissue showed areas of

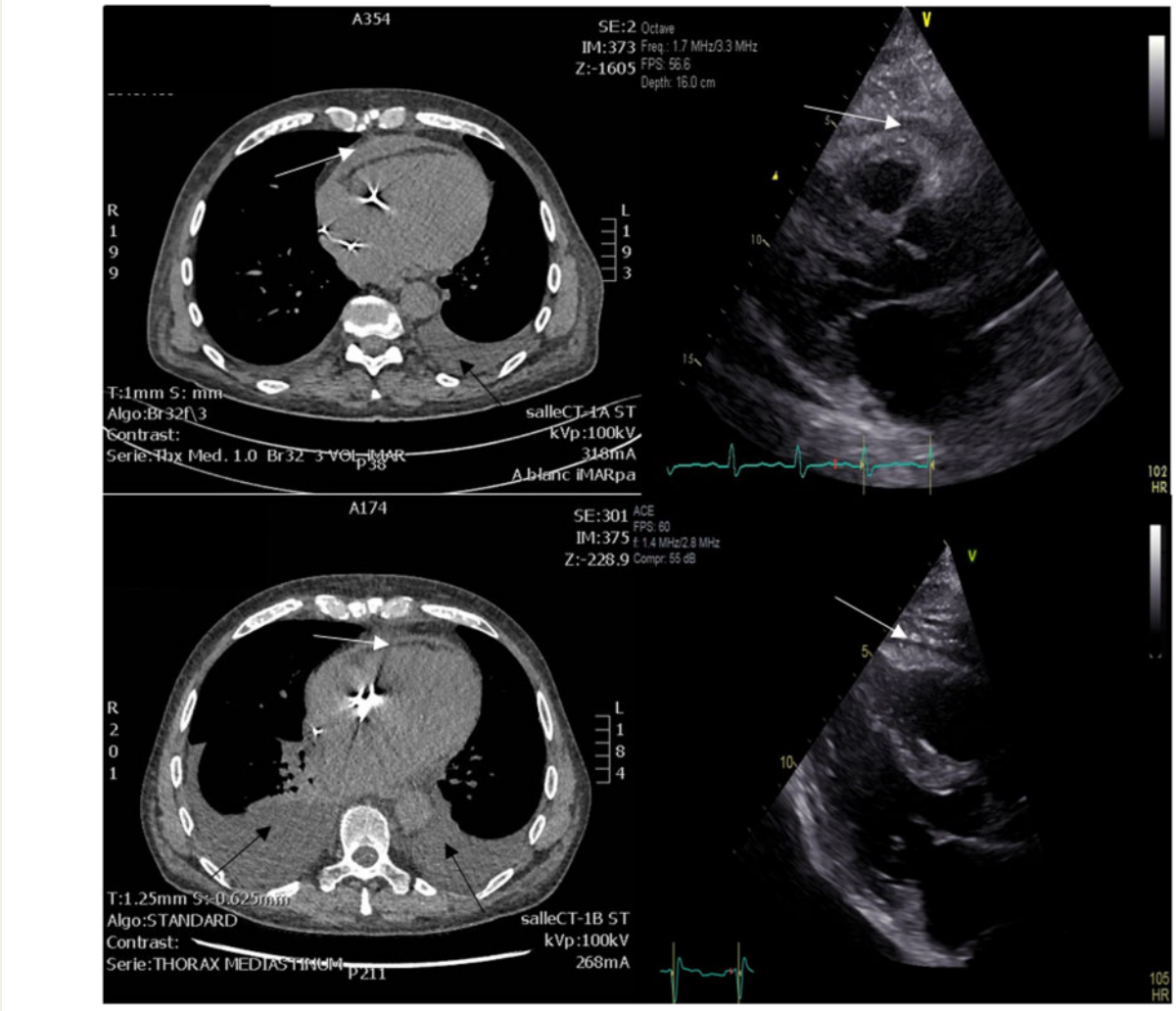

Figure 1 Computed tomography of the chest and echocardiography performed at 9 months post-operatively (upper left and right) and 11 months post-operatively (lower left and right). Upper left: Moderate pericardial effusion (white arrow) and small left pleural effusion (black arrow). Upper right: Moderate pericardial effusion. Lower left: Bilateral pleural effusion (black arrow) with small pericardial effusion (white arrow). Lower right: Small pericardial effusion.

fibrosis with chronic inflammatory infiltrate. In addition, no infectious aetiology was identified by stains nor culture.

The patient had a favourable post-operative course. He stayed 4 days in the intensive care unit and was discharged 17 days after pericardiectomy. He remains asymptomatic 4 months post-operatively. His echocardiogram showed normal ventricular function and filling pressures.

Discussion

The aetiology of CP includes infection (viral, fungal, tubercular, or parasitic), trauma, radiation, and neoplasm.[9] However, idiopathic or viral pericarditis is the predominant cause of CP in the western world.[14] Cardiac surgery is reported to be the main cause of CP in patients with an identifiable aetiology.[1,2] Constrictive pericarditis is a rare complication in HT with a reported incidence of 1.4–3.9%.[7,11] The time from HT to recognition of CP range from 3 weeks to 11 years.[3–11] Heart transplant recipients (HTR) with CP generally present with symptoms of right-sided heart failure, including peripheral oedema and ascites. The diagnostic challenge is to differentiate CP from other conditions that cause apparent congestive heart failure exacerbation unresponsive to standard medical therapy in HTR. Indeed, this rare clinical entity can be misdiagnosed as a rejection episode or restrictive cardiomyopathy.

Therefore, various procedures are generally initiated to confirm the diagnosis. Echocardiography is usually the first study performed as recommended by the European Society of Cardiology (ESC).[14]

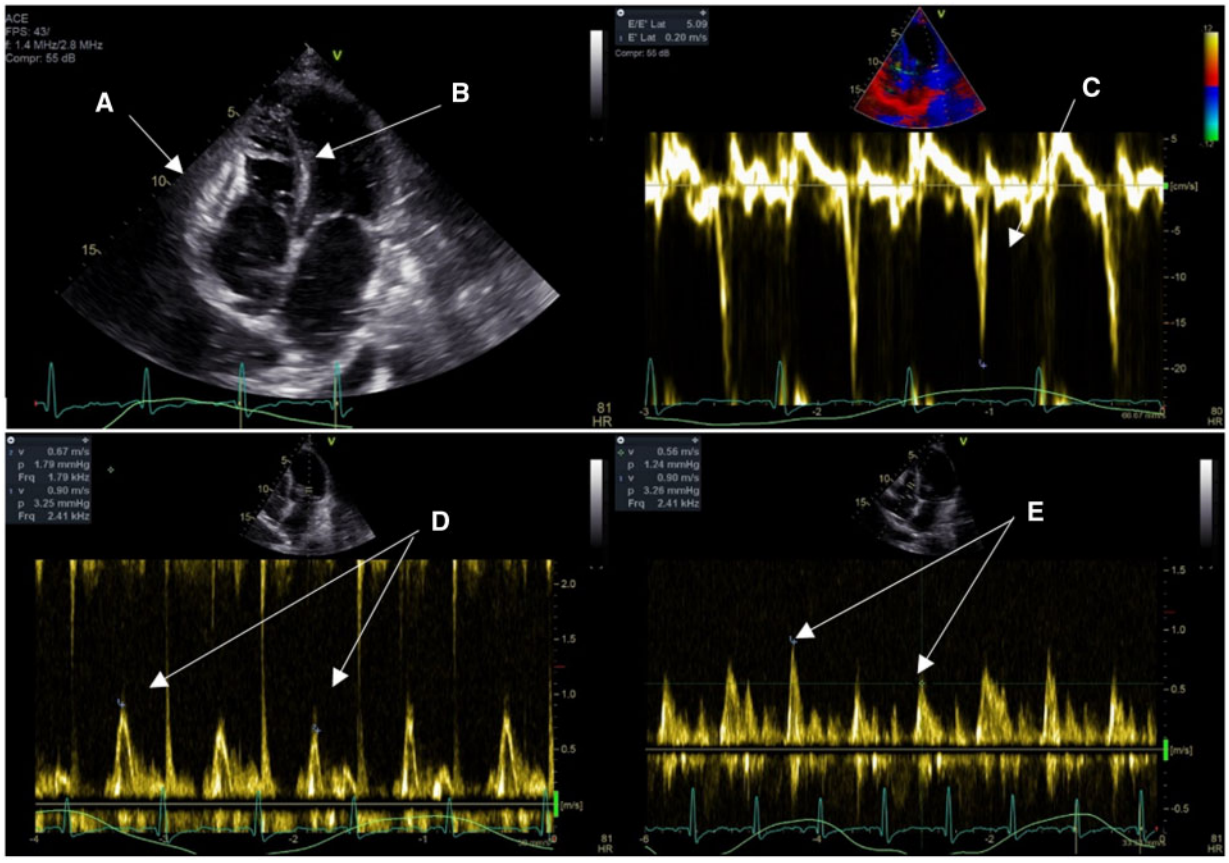

Figure 2 Echocardiography diagnostic elements of constrictive pericarditis in the patient performed at 19 months post-operatively: (*A*) thick pericardium overlying the right atrium and right ventricle, (*B*) septal bouncing in a four-cavity apical view, (*C*) high velocity of the mitral ring (greater than 8 cm/s), (*D*) respiratory variation of the E wave of the mitral flow greater than 25% with a deceleration time of less than 160 ms, and (*E*) respiratory variation of the tricuspid E wave of more than 40% with a deceleration time of less than 160 ms.

And it generally provides guidance regarding the selection of appropriate complementary procedures such as cardiac CT scan, magnetic resonance imaging, and catheterization.[11]

At the echocardiographic level, the data presented in our patient are not specific for CP and may also be encountered in the context of restrictive cardiomyopathy. However, in restrictive cardiomyopathy, there is no septal bounce and no exaggerated respiratory variation of transvalvular or hepatic vein on Doppler imaging.[14] Although the simultaneous left and right heart catheterization were not performed to confirm the diagnosis of CP, the diagnosis was based on the integration of clinical data, and multimodal imaging (echocardiography, cardiac CT scan, and haemodynamic data).

The ESC acknowledges the role of medical management in some forms of CP.[14] However, a review of the current literature about CP in HTR suggests that early radical pericardiectomy with epicardial decortication may be the most effective treatment to improve early and late survival, and functional status in this subset of patients.[3–13,15] The operative mortality rate of pericardiectomy varies from 6% to 12% in various large series.[14] It appears to be related to the patient preoperative clinical condition, and to the aetiology. Moreover, advanced cases have a higher mortality and a worse prognosis if surgery is delayed.[14]

Most of the cases of CP after HT in the literature seem to develop in patients with post-operative PE, and in patients with rejection episodes.[3–13] Although our patient did not have any major rejection episode, he developed a moderate PE 9 months post-operatively during a zoster infection. However, since we did not analysed samples of pericardial fluid, nor the resected pericardium by polymerase chain reaction on herpes zoster virus, it is difficult to associate the CP to the previous zoster infection.

Conclusion

The authors present the case of a 53-year-old man who had CP 19 months after bicaval orthotopic heart transplant for idiopathic-dilated cardiomyopathy. He successfully underwent pericardiectomy with epicardial decortication. This case highlights the importance of considering the diagnosis of CP in HTR with symptoms of congestive heart failure, and who have a preserved systolic ventricular function. Attention should be specially paid to HTR with a history of

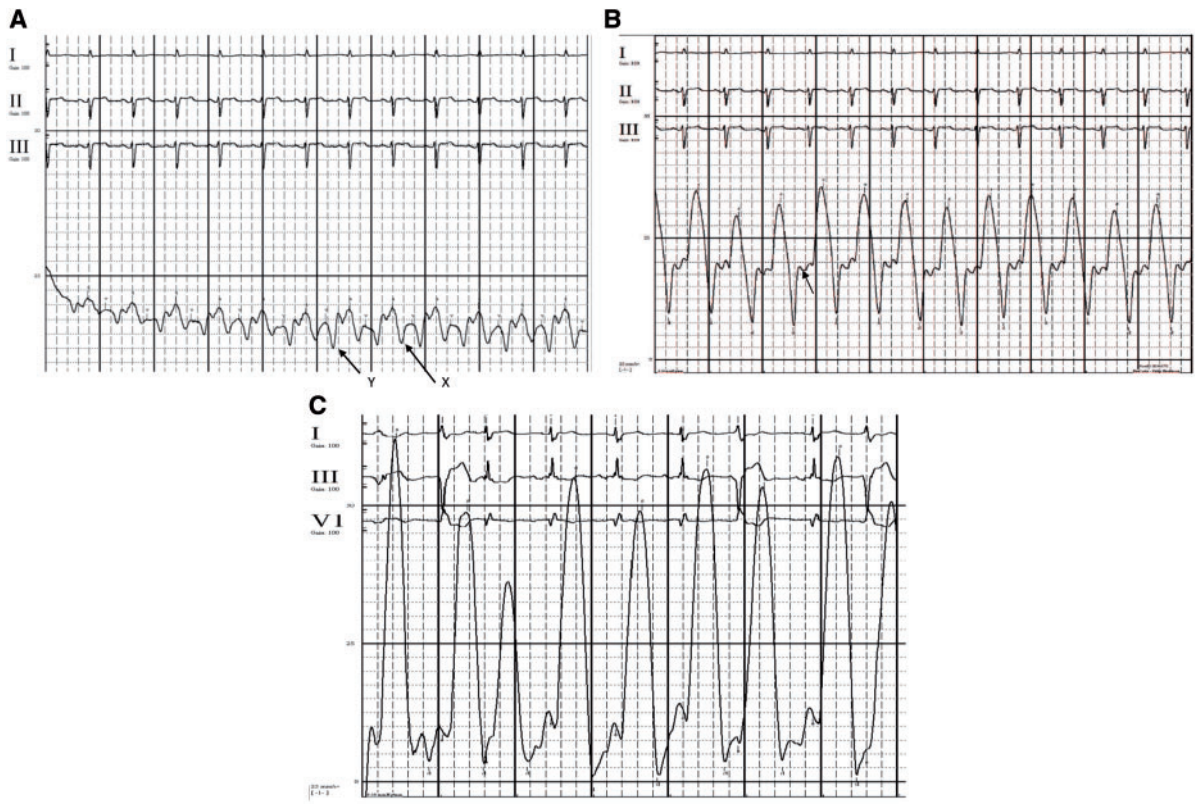

Figure 3 Right atrial and ventricle pressures tracings performed at 19 months post-operatively (*A*, *B*): (*A*) Accentuated early rapid ventricular filling occurs due to high atrial driving pressures and unimpeded ventricular relaxation, followed by a sudden rapid rise in pressure from pericardial restraint. This accounts for the rapid 'y' descent on the atrial pressure waveform and 'square root' sign on ventricular pressures (*B*). Preserved atrial relaxation, as well as an exaggerated ventricular longitudinal contraction, result in an exaggerated 'x' descent on atrial pressure tracings (*A*). Normal right ventricular catheterism (*C*).

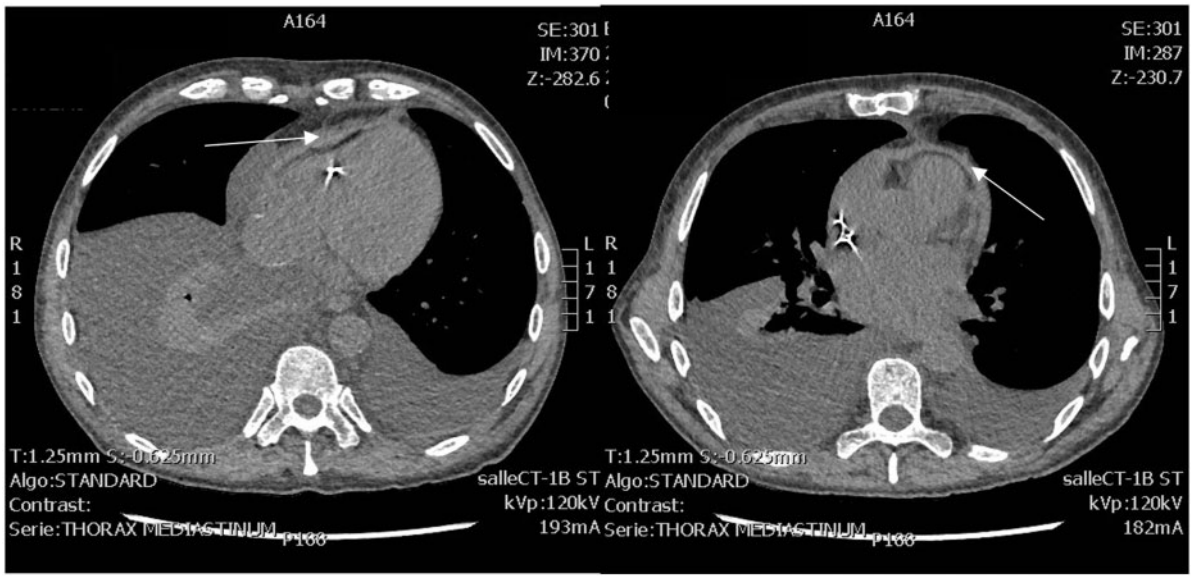

Figure 4 Computed tomography of the chest performed at 19 months post-operatively shows a thickened pericardium (white arrows), with bilateral pleural effusion.

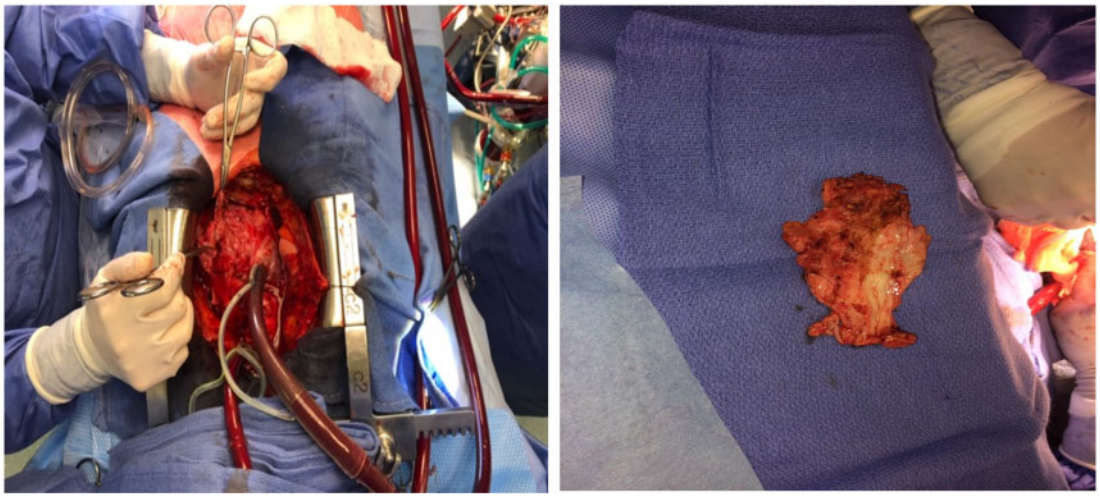

Figure 5 Radical pericardiectomy under cardiopulmonary bypass (left panel). Thickened pericardial specimen (right panel).

post-operative pericarditis, and those with rejection episodes. A rapid diagnosis followed by a radical pericardiectomy is crucial in the management of these patients.

Lead author biography

Dr Tchana-Sato, MD, PhD, graduated from university of Liege, Belgium. He completed his training in cardiovascular and thoracic surgery in the university Hospital Center of Liege, Belgium. After his surgical training in Belgium, he spent 1 year of cardiac surgery fellowship in the Peter Munk Cardiac Centre of Toronto, Canada; and an additional year in The Heart and Lung Institute of Quebec, Canada. He is currently working as a cardiothoracic surgeon in the university Hospital Center of Liege, Belgium.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidelines.

Conflict of interest: none declared.

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