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CASE REPORT
Cardiac imaging

Case report: recurrent biventricular Takotsubo cardiomyopathy in a middle-aged man with fatal outcome after full recovery

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Background Takotsubo cardiomyopathy (TC) usually manifests as transient apical ballooning of the left ventricle and may mimic acute coronary syndrome. Concomitant right ventricle involvement may occur in about a third of the cases. Recurrence had been observed in up to 10% of TC with variable ventricular involvement. Despite this knowledge, there had been no report of a patient with multiple biventricular TC in the literature to date. In this study, we describe a rare case of a patient who presented twice with biventricular TC.

Case summary A 52-year-old man with a previous episode of biventricular TC 5 months ago presented to our hospital with a 1 day history of shortness of breath and wheeze. He was treated initially for infective exacerbation of chronic obstructive airway disease. He was eventually intubated following a trial of non-invasive ventilation. He became hypotensive post-intubation and required intensive care support. An inpatient echocardiogram revealed biventricular apical ballooning. Invasive coronary angiogram showed no coronary artery disease. A repeat echocardiogram 14 days post-admission demonstrated full recovery of both ventricles. These findings were consistent with a second biventricular TC. Two months later, he was found deceased in the community seemingly from an unrelated cause.

Discussion This case describes a middle-aged gentleman who suffered recurrent biventricular TC with no consistent triggers and an unrelated fatal sequel. None of these features were typical, and to our best knowledge had not been reported before. We hypothesize that his recurrent chronic obstructive pulmonary disease exacerbations and various substance misuse might have predisposed him to this unusual presentation.

Keywords Biventricular Takotsubo cardiomyopathy • 'Broken Heart Syndrome' • Echocardiogram • Case report • Right ventricle

Learning points

- Recurrent Takotsubo cardiomyopathy involving both ventricles is rare but does occur. It may affect relatively young males with no clear identifiable cause.
- Recurrent exacerbation of chronic obstructive pulmonary disease, smoking, alcohol, marijuana, and cocaine use may be risk factors for unusual presentation of Takotsubo cardiomyopathy.

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Introduction

Takotsubo cardiomyopathy (TC) is a transient cardiac syndrome that usually involves a transient diminished left ventricular apical wall motion and mimics acute coronary syndrome.[1,2] In this study, we report a case of a gentleman who suffered from TC affecting both ventricles on two separate occasions.

Timeline

May 2017	First episode of biventricular Takotsubo cardiomyopathy (TC) in a different hospital. Had normal inpatient invasive coronary angiogram and follow-up cardiac magnetic resonance imaging.
September 2017	Presented to our hospital with a second episode of biventricular TC as described in the case report. Follow-up echocardiogram 14 days post-admission showed normalized ventricles.
Middle of November 2017	Re-admitted to hospital for bilateral pulmonary embolism and atrial fibrillation. About 11 days of hospital admission.
End of November 2017	Found dead in the community 3 days post-discharge from November's hospital admission. Post-mortem examination was unremarkable, and his cause of death was recorded as acute exacerbation of chronic obstructive pulmonary disease.

Case presentation

In September 2017, a 52-year-old man presented to our hospital with a 1 day history of shortness of breath and wheeze. He had a background history of chronic obstructive airway disease and biventricular TC diagnosed in May 2017. He was a smoker of 30 pack years and consumed 9 units of alcohol daily. He also abused cocaine and marijuana until a year ago. During the episode of TC in May 2017, he was admitted to a different hospital with shortness of breath and had normal inpatient coronary angiogram and post-discharge cardiac magnetic resonance imaging. This admission was also complicated by supraventricular tachycardia that was treated with regular diltiazem. Other regular medications included aspirin, thiamine, carbocisteine, lansoprazole, formoterol, and salbutamol.

On arrival, he was drowsy with a Glasgow Coma Scale of 11/15. Oxygen saturation was 80% on air, blood pressure (BP) of 160/80 mmHg, pulse of 150 b.p.m., respiratory rate of 30 per minute and a temperature of 37.2°C. There was widespread expiratory wheeze on auscultation with normal heart sounds. His jugular venous pulse was not visible with no evidence of peripheral oedema. Electrocardiogram (ECG) showed broad-complex tachycardia with right bundle branch block, left-axis deviation, and QTc of 380 ms, suggestive of a supraventricular tachycardia with underlying aberrancy.

Table 1 Arterial blood gas analysis of the patient on admission revealed severe type 2 respiratory failure with respiratory acidosis

pH	7.045
pO2 (kPa)	9.59
pCO2 (kPa)	13.26
O2Hb (%)	79.7
Bicarbonate (mmol/L)	26.6
Base excess (mmol/L)	-7.32
Lactate (mmol/L)	7.5

His arterial blood gas showed type II respiratory failure with a markedly raised lactate (*Table 1*), in keeping with shock. Chest X-ray (CXR) was unremarkable (*Figure 1*). Inflammatory markers were raised with white cell count of 19.6 x 109/L (3.7–11.1) and C-reactive protein of 25 mg/L (0–6). He was treated empirically as infective exacerbation of chronic obstructive pulmonary disease (IECOPD) including non-invasive ventilation.

However, the respiratory acidosis worsened shortly after and he required tracheal intubation and mechanical ventilation. His broad-complex tachycardia had been decided to be treated with verapamil for rate control (*Figure 2*) (authors comment: However, as the patient was suffering from a shock, electrical cardioversion should have been considered as a more suitable first-line treatment). The systolic BP plummeted to 49 mmHg post-intubation which necessitated noradrenaline infusion.

On day 2, the patient remained hypotensive requiring ongoing noradrenaline infusion. He was able to gradually wean off his mechanical ventilation. Repeat ECG showed sinus rhythm with anterior Q waves. Trans-thoracic echocardiography demonstrated left ventricular (LV) systolic dysfunction with ejection fraction (EF) of 28%, preserved basal posterior, lateral, anterior-septal, and infero-septal contractility with apical ballooning (*Figure 3*; Supplementary material online, *Video S1*). The right ventricle (RV) was borderline dilated with akinesis of the mid to apical free wall (*Figure 4*; Supplementary material online, *Video S2*). These echocardiographic findings implied biventricular TC changes.

On day 3, noradrenaline was eventually weaned off. He had episodes of non-sustained ventricular tachycardia but remained stable. A coronary angiogram prior to discharge showed no coronary artery disease (*Figure 5*), confirming the TC diagnosis. On discharge, spironolactone 25 mg and furosemide 40 mg were added for diuresis. Regular diltiazem was stopped and Carvedilol 3.125 mg was started to manage his non-sustained ventricular tachycardia. Repeat echocardiogram 14 days post-admission showed normalized biventricular size, shape, and systolic function (Supplementary material online, *Video S3*). A follow-up cardiology outpatient clinic in 6 weeks' time was arranged.

In November 2017, the patient was re-admitted with worsening breathlessness and wheeze. Clinical observations on arrival were stable apart from mild hypoxia of 90% on air with no pyrexia. There was decreased air entry on his left lung base and bilateral mid-zone wheeze with no consolidation on CXR. His C-reactive protein was

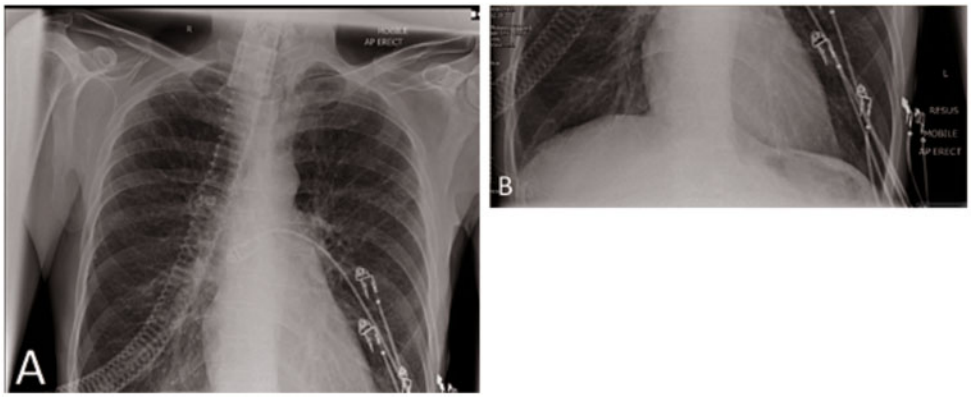

Figure 1 Chest radiographs on admission. (*A*) Hyperinflated chest with no obvious consolidation, pulmonary infiltrates, or cardiomegaly. (*B*) Repeat film taken at the same time as (*A*) with a focus on lung bases—which were clear.

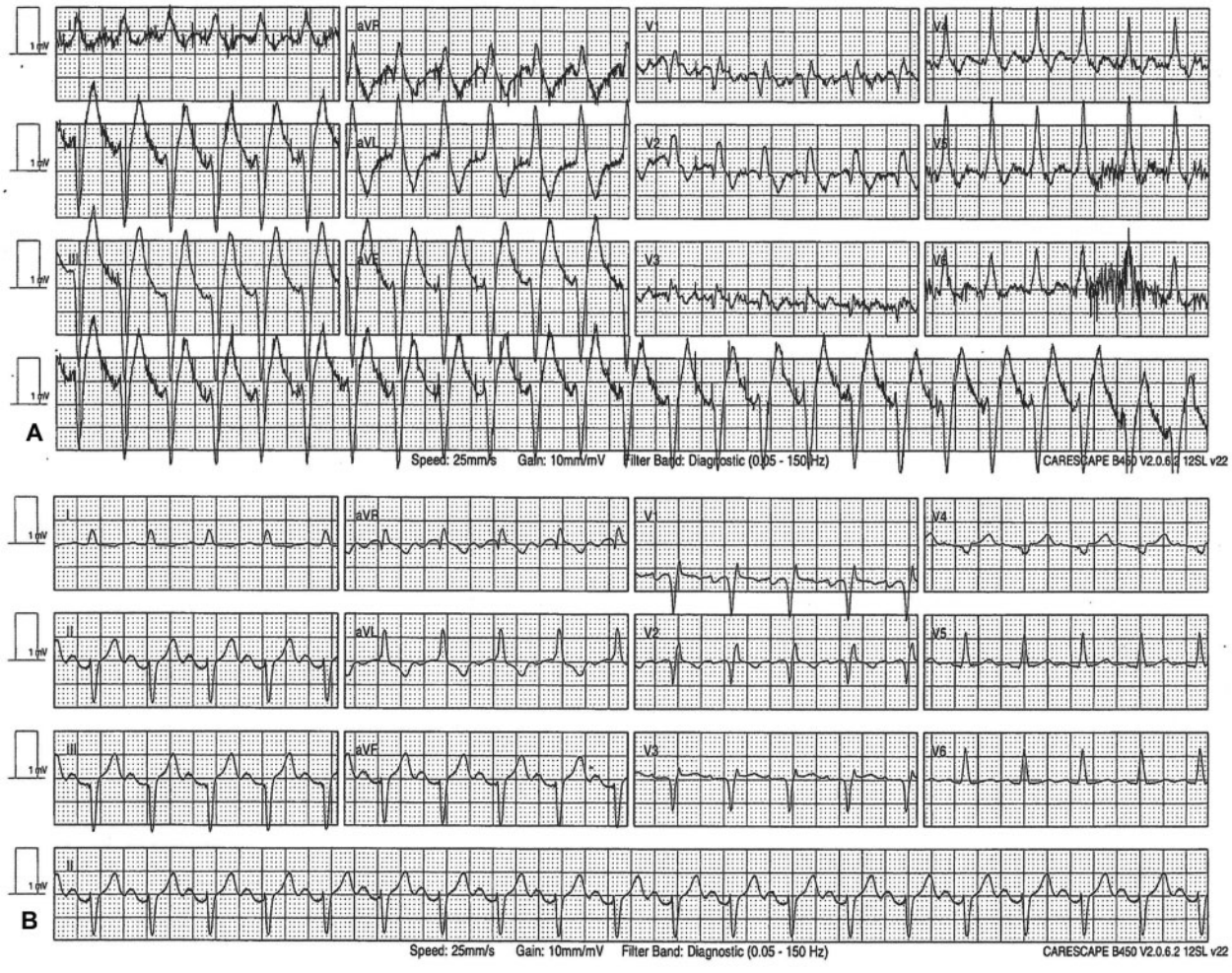

Figure 2 Electrocardiograms on admission. (*A*) Broad-complex tachycardia with evidence of left-axis deviation and right bundle branch block and right-ventricular strain and T-wave inversions in leads V2 and V4. (*B*) Repeat electrocardiogram taken 2 h post-admission showing improvement of tachycardia following administration of Verapamil.

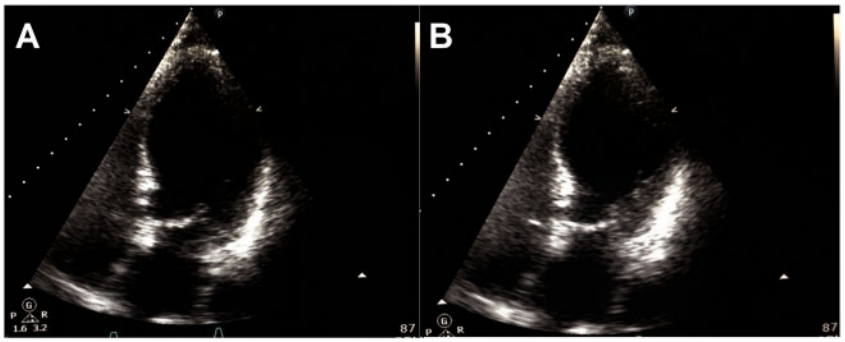

Figure 3 Trans-thoracic echocardiography images. Apical four-chamber views showing (*A*) end-diastolic and (*B*) end-systolic frames demonstrating LV apical ballooning.

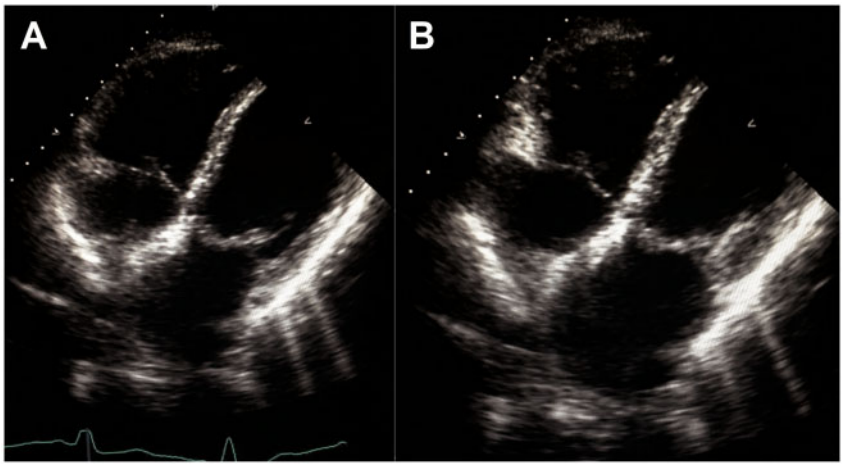

Figure 4 Trans-thoracic echocardiography images. Modified apical four-chamber views showing (*A*) end-diastolic and (*B*) end-systolic frames demonstrating both LV and RV apical ballooning.

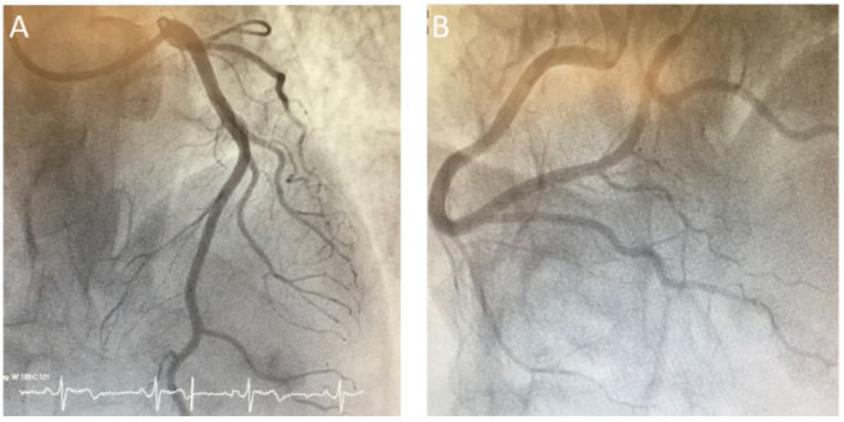

Figure 5 Invasive coronary angiography showing normal coronary arteries. (*A*) Left coronary artery and (*B*) right coronary artery.

raised to 62 mg/L (0–6). Based on this, he was treated for another IECOPD. Opportunistic CTPA revealed bilateral pulmonary embolism and was treated with rivaroxaban (initially 15 mg BD for 21 days, then 20 mg OD). Three days following discharge, he was found deceased at home. Post-mortem examination revealed minimal atherosclerosis in the coronary arteries. The left ventricle was normal in shape with maintained wall thickness and no fibrosis or recent myocardial infarction was seen. The pulmonary vasculature was normal, with no evidence of thromboembolism. Both lungs were oedematous but no consolidation, inflammation, or aspiration was identified. The cause of death had been recorded as acute exacerbation of chronic obstructive pulmonary disease.

Discussion

TC, also known as the 'broken heart syndrome', had been linked to emotional or physical stress with higher incidence in elderly women.[3] The underlying aetiology of TC is not entirely understood still at present, and an excessive release or surge of catecholamines is proposed. Our patient was a young male with no common identifiable precipitant prior to his first TC episode. He did, however, suffer from an IECOPD during the second TC episode. Furthermore, he also possessed lifestyle habits that could have made him more susceptible to TC such as smoking, alcohol, marijuana, and cocaine abuse,[4] as also corroborated in the 2018 international consensus document on TC.[5]

During his second TC episode, our patient was hypotensive with an left ventricular ejection fraction of 28% requiring vasopressors as well as no evidence of LV outflow tract obstruction. Beta-blockers were not utilized acutely in accordance with the 2018 international consensus document part II recommendation on the management of TC.[6] This document concurred that beta-blockers were not able to prevent recurrence of TC. On the other hand, angiotensin-converting enzyme inhibitors (ACEi) were recommended to facilitate LV recovery, improve 1-year survival, and reduce recurrence. Our patient was discharged on Carvedilol as he suffered from non-sustained ventricular tachycardia. However, he was not commenced on an ACEi as he had a full recovery of his LV systolic function with a tendency to suffer from hypotension. His LV remodelling seemed to be sustained as confirmed on his post-mortem examination.

On both TC episodes, our patient was found to have an acute onset severe apical biventricular dysfunction that completely resolved within 1 month. Although TC had generally been regarded to carry a relatively benign prognosis, there is an increasing evidence suggesting that it is potentially a more sinister syndrome associated with various short-term and long-term complications.[4,7] In the acute setting, concomitant RV involvement had been observed in 25–42% of patients.[8] These patients were consistently associated with a more severe clinical course, requiring more aggressive and intensive management.[9,10] Nonetheless, there was no strong evidence to suggest that RV involvement alone significantly influences in-hospital and long-term mortality.[11] Following recovery, the risk of TC recurrence had been reported at 5–10%.[12] It had recently been recognized that patients with recurrent TC may present with different forms of TC, including new RV involvement during their recurrent episode.[13] According to our knowledge there have been no reports of a patient with recurrent biventricular TC to date.

The novel aspect of this case was the recurrence of biventricular TC in a young male with no identifiable trigger during his first episode and a seemingly unrelated fatal sequel few months post-discharge. These features do not fit the typical patient group for TC, and to the best of our knowledge remained a TC phenotype that had not been described before. We hypothesize that in this patient, the recurrent exacerbation of chronic obstructive pulmonary disease, smoking, alcohol consumption habits, remote marijuana use, and cocaine abuse might have predisposed him to this unusual presentation.

Lead author biography

Dr Elton Lian Chen Luo graduated in 2015 from the University of Edinburgh. He is currently working as a junior doctor in the Buckinghamshire Healthcare NHS Trust. He has an interest in clinical cardiology and research and would like to pursue this as his career.

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 authors 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 guidance.

Conflict of interest: none declared.

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