




Takotsubo syndrome after mitral valve surgery: a case report

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Background

Takotsubo syndrome is a frequent entity; however, it has never been described after a mitral valve surgery.

Case summary

We present the case of a 79-year-old woman, with background of atrial fibrillation and a left atrial appendage closure device, who was admitted for elective mitral valve replacement, because of asymptomatic severe primary mitral regurgitation. Biologic mitral valve was implanted without incidences, but in the postoperative, she developed cardiogenic shock. Electrocardiogram (ECG) showed inverted T waves in precordial leads and an echocardiography showed severe left ventricular (LV) dysfunction with mid to distal diffuse hypokinesia, and better contractility in basal segments. Troponin levels were mildly elevated. With the suspicion of a postoperative acute coronary syndrome, a coronary angiography was performed and showed no significant coronary lesions. The haemodynamic situation was compromised for the next 48 h, in which vasoactive support and intra-aortic balloon counterpulsation were implemented. After 48 h, the haemodynamic situation suddenly improved. The ECG was normalized, and a control echocardiogram showed partial recovery of the LV function with resolution of regional wall motion abnormalities. The patient could be discharged at 1 week. The clinical picture was interpreted as a stress cardiomyopathy after mitral valve surgery.

Discussion

Takotsubo syndrome is a threatening condition; complications in acute phase could lead to a fatal outcome. Mitral valve surgery has to be considered as a trigger for this entity, after excluding coronary involvement, specially of left circumflex artery.

Keywords

Stress cardiomyopathy • Cardiogenic shock • Mitral valve surgery

Learning points

- A cardiac surgery is a stress condition that can trigger a Takotsubo syndrome.
- The prognosis of Takotsubo syndrome depends on the tolerance of the acute phase, and cardiogenic shock is one of the most threatening conditions.
- After the acute phase, recovery of the left ventricular ejection fraction is possible.

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Introduction

Takotsubo syndrome is a common entity among post-menopausal women¹. Patients show transient left ventricular (LV) dysfunction presenting as apical ballooning or as midventricular, basal, or focal wall motion abnormalities (WMA).¹ It can be precipitated by an emotional or physical trigger and it has been described in the postoperative period of abdominal,² gynaecologic,³ and urological⁴ surgery. Here, we present a case of Takotsubo syndrome following mitral valve replacement surgery.

Timeline

| | |
|---------------|---|
| Day 1 morning | Admission for elective cardiac surgery due to asymptomatic severe primary mitral regurgitation. Previous left ventricular ejection fraction (LVEF) was 56% with normal left ventricular (LV) diameters. Previous computed tomography (CT) angiography showed no coronary lesions. Cardiac surgery with biologic mitral valve implantation was performed without incidence. Low doses of noradrenaline were required after extracorporeal circulation. |
| Day 1 evening | Postoperative: on arrival to intensive care unit the patient presented with cardiogenic shock. An electrocardiogram showed inverted T waves in precordial leads. An echocardiogram showed severe LV dysfunction (LVEF 20%) with mid to distal diffuse hypokinesia. An urgent coronary catheterization showed normal coronary arteries. |
| Days 2 and 3 | The haemodynamic status was compromised for the next 48 h: vasoactive drugs (noradrenaline and dobutamine) and intra-aortic balloon counterpulsation were needed. |
| Day 4 | Spontaneous haemodynamic improvement, leading to progressive suspension of supportive measures. An echocardiogram showed an improvement of LVEF to 45–50%. |
| Day 11 | Normal LV systolic function (LVEF 50%). Discharge. |

Case presentation

We describe the case of a 79-year-old woman, with a history of atrial fibrillation, who had undergone left atrial appendage (LAA) closure device implantation due to contraindication for anticoagulation because of a previous subdural haemorrhage. She was admitted for elective mitral valve replacement due to asymptomatic severe primary mitral regurgitation caused by anterior veil prolapse. An echocardiogram performed a month before showed a left ventricular ejection fraction (LVEF) of 56% and normal LV diameters. CT-angiography prior to surgery showed absence of coronary lesions.

On admission, cardiac auscultation revealed a systolic murmur in mitral focus at the apex. Lung auscultation was normal. Prior to the surgery, the patient was on acetylsalicylic acid 100 mg/day. Cardiac surgery was uneventful. Since valve repair was not considered feasible, a Magna Ease biological mitral valve was implanted, maintaining the LAA closure device. Intra-operative transoesophageal echocardiography showed normal functioning of the prosthesis and extracorporeal circulation was concluded. Only low doses of noradrenaline (0.05 µg/kg/min) were required after extracorporeal circulation.

On arrival to the intensive care unit (ICU), the patient presented with cardiogenic shock: she presented cold extremities and oliguria, systolic blood pressure was 80 mmHg and blood analysis showed metabolic acidosis and elevated serum lactate; therefore, requiring vasoactive agents (noradrenaline at 0.1 µg/kg/min and dobutamine at 5 µg/kg/min). An electrocardiogram (ECG) revealed atrial flutter with a rapid ventricular rate (150 b.p.m.), which was electrically cardioverted. An ECG performed after cardioversion showed inverted T waves in precordial leads (Figure 1) and pulmonary congestion was evidenced on chest X-ray (Figure 2). The findings of an echocardiogram showed severe LV dysfunction (LVEF 20%) with mid to distal diffuse hypokinesia that was more severe in the anterior and septal walls, which were almost akinetic. Contractility was much better in all basal segments (Supplementary material online, Video S1). Mitral prosthesis function was normal. Owing to a suspected coronary complication secondary to cardiac surgery, the patient underwent urgent coronary angiography, which showed absence of significant coronary lesions (Supplementary material online, Video S2). Troponin I levels were elevated to 0.12 ng/mL (normal value <0.08). Her haemodynamic status was compromised for the following 48 h, during which time vasoactive drugs (noradrenaline ranging from 0.1 to 0.2 µg/kg/min and dobutamine ranging from 5 to 7 µg/kg/min, adjusted to haemodynamic status) and intra-aortic balloon counterpulsation were needed. Daily echocardiographic evaluations showed similar images that resembled the first one, with severe LV dysfunction and regional WMA in the mid to distal segments. After 48 h, the haemodynamic status of the patient suddenly improved, leading to progressive suspension of supportive measures; echocardiography at 48 h showed partial recovery of LV systolic function, with an LVEF of 45–50% and mild paradoxical septal motion (Supplementary material online, Video S3). The electrocardiographic changes also reverted (Figure 3). Altogether, the clinical picture of the patient was interpreted as a stress cardiomyopathy occurring in the postoperative period of mitral valve replacement surgery. After 1 week, the patient was discharged. Treatment at discharge was acetylsalicylic acid 100 mg/day. One month later, she was asymptomatic and had low to normal LVEF (50%).

Discussion

We describe the case of a woman who developed stress cardiomyopathy following mitral valve surgery. Postoperative Takotsubo syndrome has been described in isolated clinical cases (after vaginal,³ urologic,⁴ and abdominal surgery²). Some cases have been described after cardiac surgery,^{5,6} and others following mitral valve surgery.^{7–9} Stress cardiomyopathy is a life-threatening condition that usually appears after an emotionally or physically stressful situation.

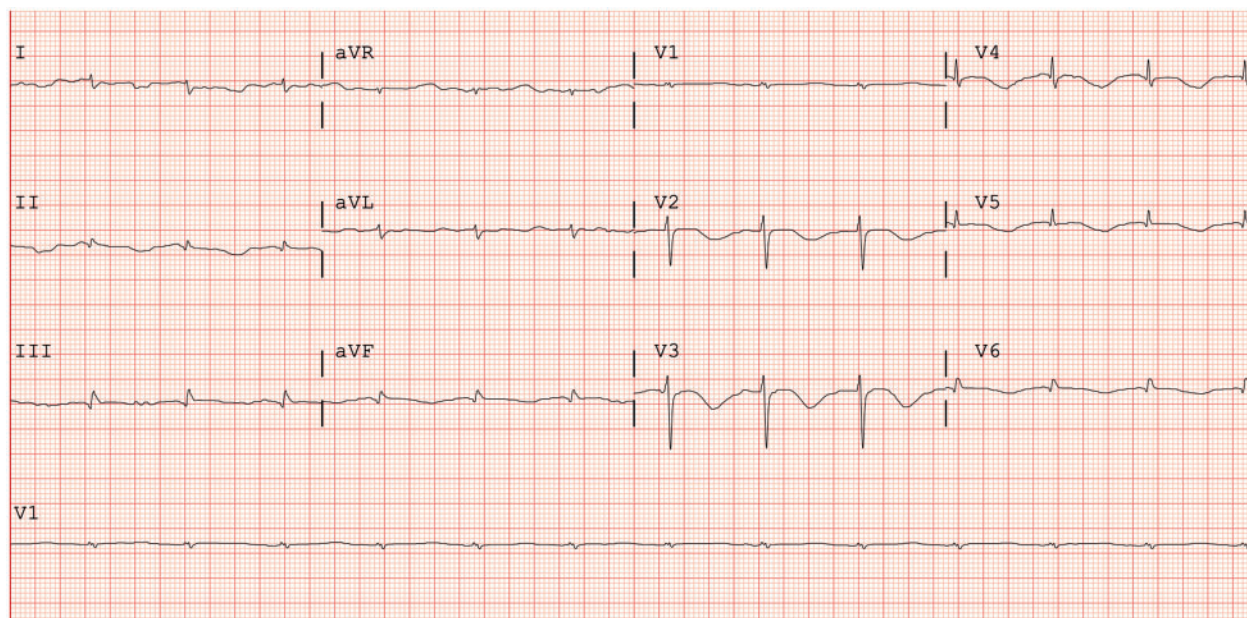


Figure 1 Electrocardiogram after electrical cardioversion showed negative T waves in precordial leads.

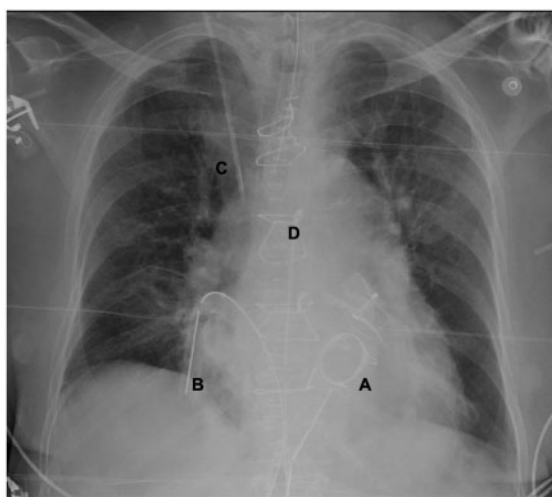


Figure 2 Postoperative chest X-ray showing pulmonary congestion. Biological mitral valve prosthesis (A), pericardial drainage (B), central venous line (C), and sternal wires (D) are in evidence.

Hospitalization for acute diseases and surgery can precipitate stress cardiomyopathy.^{1,10}

Additionally, stress cardiomyopathy has been described as a reaction to the administration of exogenous drugs such as catecholamines^{11,12} related to excessive sympathetic stimulation as the pathogenic mechanism. High mortality rates (up to 12%) have been reported in patients with Takotsubo syndrome who receive treatment with catecholamine drugs, though this may be influenced by a

selection bias caused by the inclusion of patients with existing critical illness.¹³ Excessive stimulation of the sympathetic nervous system may have triggered the onset of the disease in this case; however, low doses of vasoactive agents are commonplace in cardiac surgery, causing no adverse consequences, which suggests that other factors may have been implicated in this particular case.

Differential diagnosis of Takotsubo syndrome should include acute coronary syndromes (ACS), as stress cardiomyopathy overlaps with ACS in its clinical presentation as well as ECG abnormalities.¹⁰ In situations such as this one, in which the patient develops cardiogenic shock during the postoperative period of cardiac surgery with acute ECG changes and LV dysfunction with regional WMA, the first possibility to rule out is coronary involvement. As this case developed in a context of mitral valve surgery, the coronary artery most likely involved would have been the left circumflex (LCX) coronary artery.¹⁴ This, however, was not supported by findings, as an urgent coronary angiography showed a normal LCX; indeed, no other significant lesions were observed. Given the normal coronary angiography, reversion of the electrocardiographic changes, and the almost complete recovery of LV function, we suspected that the patient may have developed Takotsubo syndrome in the postoperative period of mitral valve replacement surgery. A type II myocardial infarction, explained by a mismatch between myocardial oxygen supply and demand, must also be considered, since the patient presented an atrial flutter with a rapid ventricular response. However, evidence of severe LV systolic dysfunction together with regional WMA was not suggestive of this entity. Acute myocarditis could also be included in the differential diagnosis; nonetheless, it usually presents in young or middle-aged populations and is often preceded by an upper respiratory infection or enteritis.¹⁰

The prognosis of Takotsubo cardiomyopathy depends on the tolerance and the management of the acute phase, which is the most

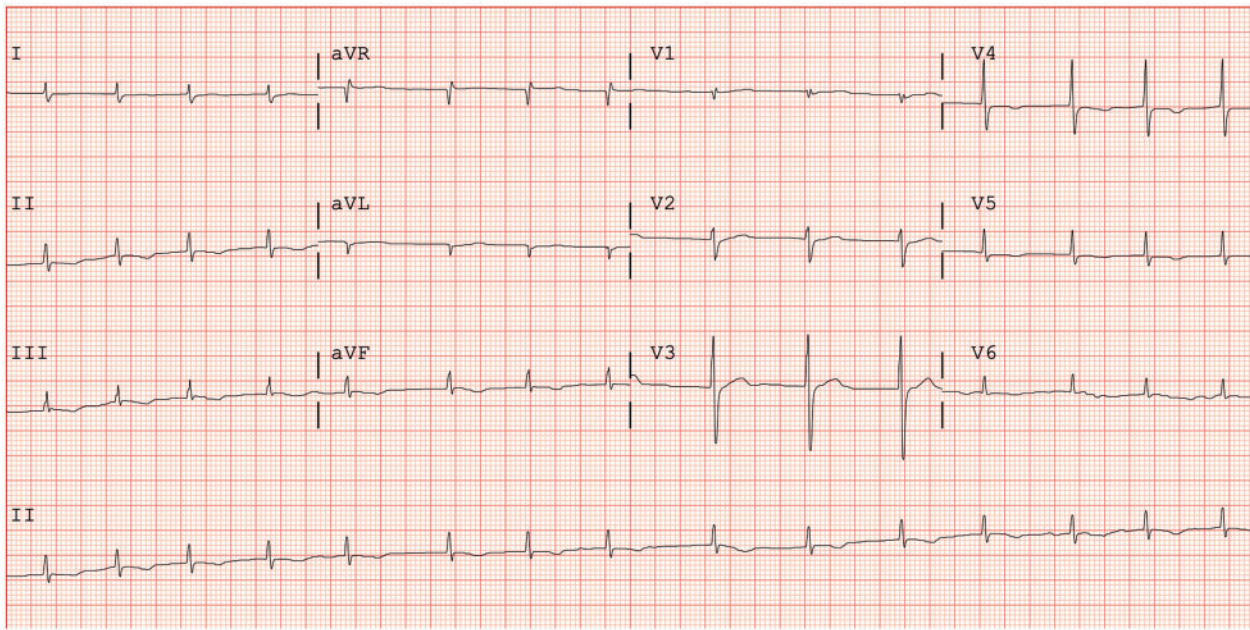


Figure 3 Electrocardiogram at 1 week. Changes in precordial leads had nearly disappeared, as only small negative T waves in V4 remained. Basal rhythm was atrial fibrillation, a previous finding in this patient.

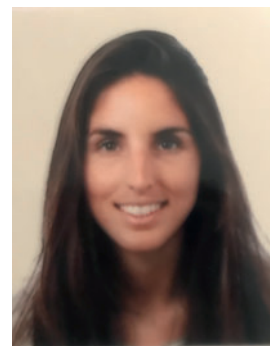
compromising, and the ability of the patient to survive this crucial stage. Cardiogenic shock, ventricular arrhythmias such as torsade de pointes, and cardiac arrest are the most dangerous complications. Management of patients in the acute phase can be challenging. For patients with hypotension and shock, the treatment of choice is based on the existence of left ventricular outflow tract obstruction (LVOTO).¹⁰ When obstruction is present, the use of an intra-aortic balloon pump is not recommended,¹⁵ and an LV assist device such as Impella or venoarterial extracorporeal membrane oxygenation should be considered. In the case reported here, LVOTO was ruled out; in such situations, intra-aortic balloon pump and the Impella device can be considered for temporary support.¹⁰ In the described case, an intra-aortic balloon pump was implanted during cardiac catheterization. The response to aortic counterpulsation in addition to vasoactive drugs was acceptable, and although other assist devices were considered, they were finally not implemented. The use of anticoagulation in Takotsubo syndrome is not well-defined¹⁰; in this case, where there was a contraindication for anticoagulation, such therapy was not initiated. Single antiplatelet therapy was prescribed at discharge.

Conclusion

This clinical scenario is important and should be taken into consideration by ICU physicians and cardiologists providing care for patients after cardiac surgery. Coronary angiography or CT-angiography remains the gold standard for the diagnosis of this entity; however,

clinical suspicion must be high as mitral surgery is an aggressive procedure that can easily be a trigger for this threatening condition.

Lead author biography



Ana Devesa is currently working in Fundación Jiménez Díaz as a Cardiology resident. At the same time that she started the residency in Cardiology she began to collaborate in CNIC as visiting scientist. She got implied in some research projects, her main area of study being cardiac amyloidosis. She has published some articles in impact journals in this area and she's now elaborating her PhD work on the subject.

Supplementary material

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

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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 guidance.

Conflict of interest: none declared.

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