

Takotsubo Syndrome After Mitral Valve Surgery: Multimedia Presentation of a Rare Diagnosis

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Introduction

The Takotsubo Syndrome, also known as “broken heart syndrome”, is characterized by a severe and transitory left ventricular dysfunction, with the presence of alterations in the contraction of the basal, medial, or apical segments of the left ventricular walls.¹ The syndrome can be caused by an emotional or physical trigger, or by a combination of both; however, this is not a mandatory criterion for its diagnosis.²

This study describes a case of Takotsubo Syndrome after mitral valve surgery to replace the valve with a mechanical prosthesis.

Case report

A 56-year-old, female patient, with a history of smoking, atrial fibrillation, rheumatoid arthritis, and mitral stenosis, underwent a percutaneous mitral valvuloplasty in 2007, using warfarin, atenolol, digoxin, amiodarone, prednisone (intermittent), hydroxychloroquine, and leflunomide. The patient was hospitalized to undergo elective mitral valve replacement surgery.

The transthoracic echocardiogram showed an ejection fraction of 64%, with an increase in the left atrium (indexed volume of 122ml/m²) and eccentric left ventricular hypertrophy. The mitral valve presented thickened cusps, with the posterior leaflet fixed and the anterior with a cup-shaped opening. The Doppler imaging showed an important reflux with a maximum and average gradient of 14 and 4 mmHg, respectively. The planimetry indicated a valve area of 1.9 cm². The previously conducted cinecoronariography showed a 40% obstruction in the anterior descending artery (Figure 1).

The patient underwent mitral valve surgery to replace the valve with a mechanical prosthesis, and to close the left atrial auricle, without complications. On the second

post-operative day, the patient evolved with a hypertensive acute pulmonary edema and atrial fibrillation with a good ventricular response, introducing a treatment with intravenous amiodarone, nitroglycerin, and furosemide. The electrocardiogram presented a T-wave inversion in the V2-V4 derivations (Figure 2). A transthoracic echocardiogram was performed, which presented hypercontractility of the basal segments and akinesia of the medial, apical, and apex segments (standard suggestive of Takotsubo cardiomyopathy), as well as a high-degree systolic dysfunction of the left ventricle (ejection fraction of the left ventricle = 22% by the Simpson method). The mitral mechanical prosthesis showed a normal function, with no obstruction of the left ventricle outflow (Figure 3 and 4, Videos 1 and 2). Due to a suspected coronary complications resulting from the heart surgery, a dose of troponin was applied, which showed a value of 3,305 ng/L (reference: < 11 ng/L). However, the patient's coronary anatomy was only understood after the decision by the clinical-surgical team, along with the results from the imaging exams (echocardiographic standard) and the given surgical context. For this reason, we opted to manage this situation clinically.

Due to the worsening of her medical condition, the patient underwent orotracheal intubation and therapy with noradrenaline (0.25 mcg/kg/min), and dobutamine (8 mcg/kg/min) was applied in the context cardiogenic shock. After 96 hours, The patient's medical condition improved to a hemodynamic state, leading to the gradual suspension of the support measures. The echocardiogram showed a recovery of the systolic function of the left ventricle, with a left ventricle ejection fraction of 61%, with anomalous movement of the intraventricular septum and myocardial contractility preserved in the other segments of the left ventricle. The mechanical prosthesis was in the mitral position, with a good excursion of its mobile elements.

After an excellent clinical evolution, the patient was released from the ICU, with subsequent outpatient follow-up.

Keywords

Mitral Valve; Takotsubo Cardiomyopathy; Ventricular Dysfunction

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Discussion

The Takotsubo Syndrome has been described in some cases of patients submitted to gynecological, urological, and abdominal surgeries.³ The cardiovascular procedures are also reported as triggers of the Takotsubo Syndrome, including stress tests with dobutamine, pericardiocentesis, cardioversion of atrial fibrillation, insertion of a pacemaker, electrophysiological tests, ablation and valve replacement surgery, and the use of a transcatheter.⁴

Takotsubo cardiomyopathy in the perioperative period has

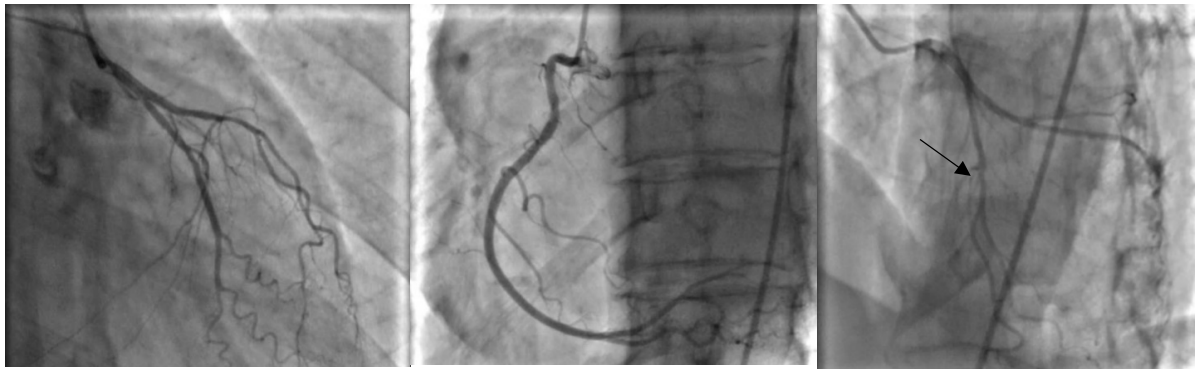


Figure 1 – Preoperative cinecoronariography showing a lesion of 40% in the descending artery.

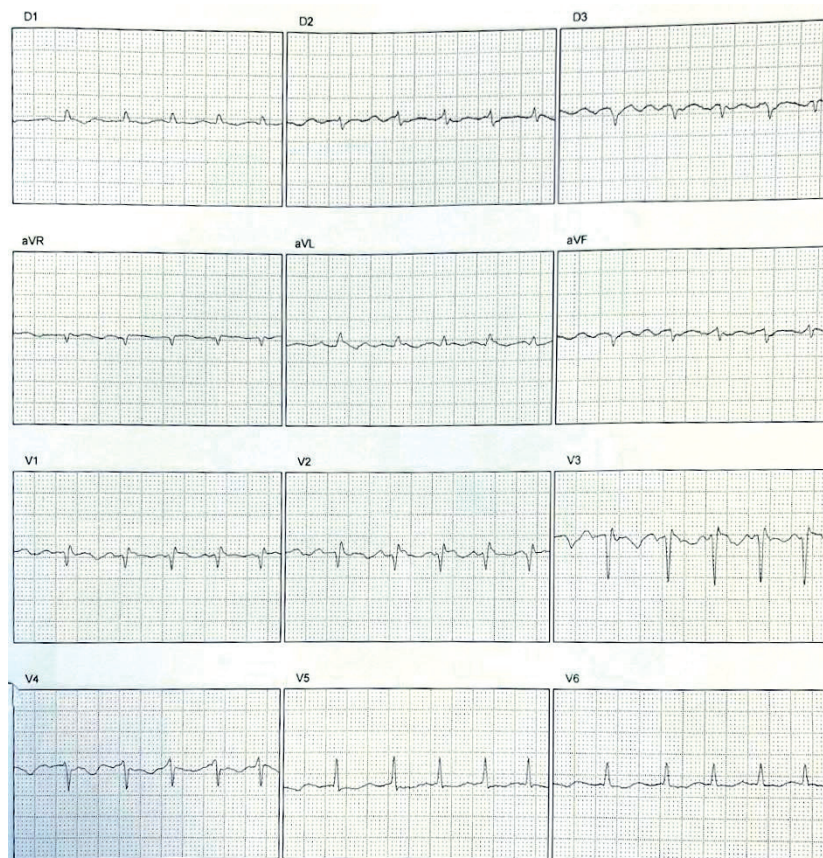


Figure 2 – Electrocardiogram taken in the Intensive Care Unit, showing atrial fibrillation associated with T-wave inversion on the anterior wall.

gained recognition, but its association with heart surgery is, to a great extent, mostly unknown and rarely described.⁵ There are insufficient data in the literature on which to base the hypothesis of the prevalence of a cardiothoracic procedure or other procedure concerning the increased risk of the development of the syndrome. However, what is important to note here is the increase in the number of cases that describe

the development of Takotsubo Syndrome after heart surgery.⁵

The possible mechanisms associated with the event in patients submitted to heart surgery are likely multiple, such as a coronary vasospasm (epicardial and microvascular ischemia), toxicity mediated by catecholamine, and excessive sympathetic activation.⁶

Case Report

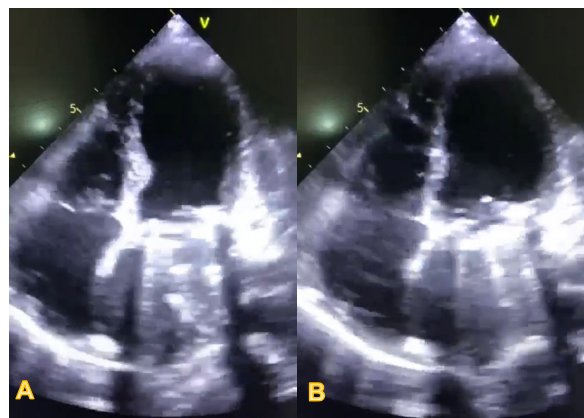


Figure 3 – Transthoracic Echocardiogram, showing, during the systole (A) and the diastole (B), respectively, movement of the basal segment and akinesia of the medial and apical segments.

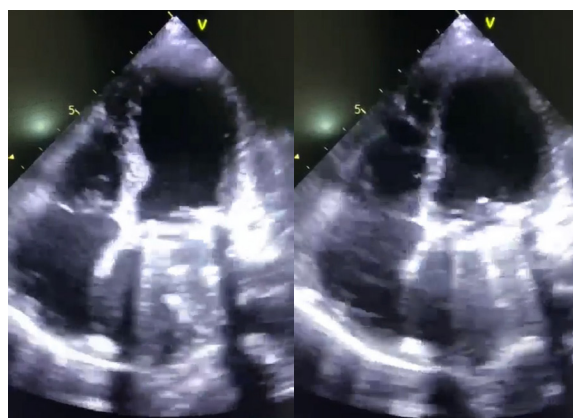
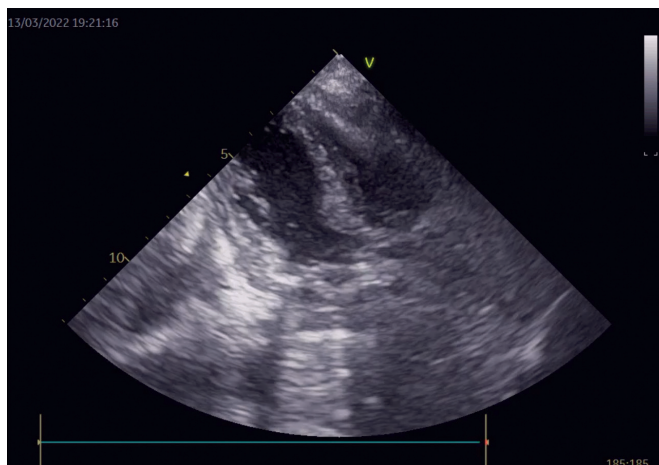
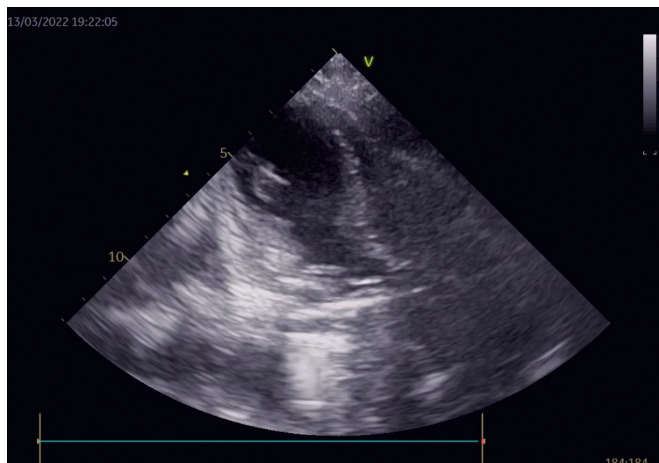


Figure 4 – Transthoracic Echocardiogram, showing, during the systole (A) and the diastole (B), respectively, movement of the basal segment.



Video 1 – Link: http://abcimaging.org/supplementary-material/2023/3601/ABC_362_RC_video-01.mp4



Video 2 – Link: http://abcimaging.org/supplementary-material/2023/3601/ABC_362_RC_video-02.mp4

Lyon et al.,⁷ in a review of the physical-pathological mechanisms involved in the genesis of this syndrome, highlight the intense sympathetic activation, as well as the high levels of catecholamines, as central **triggers**. These findings are related to micro and macrovascular dysfunctions and, consequently, to the dysfunction of the cardiomyocytes and their respective consequences evidenced in the manifestation of the syndrome.

Thus, the development of electrocardiographic abnormalities, circumferential dysfunction of the ventricular contraction, clinical signs/symptoms (precordial pain and/or hypotension/circulatory shock) in the postoperative period of cardiovascular surgery are possible manifestations of the Takotsubo Syndrome, likely caused by extracorporeal circulation and surgical trauma, factors associated with the rise in catecholamines in this post-procedural period. Fundao et al., in their study, showed that these patients represented 10.4% of the cases.⁸

Many entities around the world have created diagnostic criteria to recognize this syndrome.⁶ In an attempt to define a consensus, a new group of diagnostic criteria (InterTAK criteria) was proposed by specialists in 2018, including:

- *The patients show a transitory left ventricular dysfunction (hypokinesia, akinesia, or dyskinesia), appearing with an apical or medial ventricular ballooning, basal, or focal abnormalities of wall movement. The involvement of the right ventricle may appear;*
- *An emotional, physical, or combined trigger can precede the Takotsubo Syndrome event, but this is not a mandatory factor;*
- *New abnormalities in the ECG are present (ST-segment elevation, ST-segment depression, T-wave inversion, and QTc extension); however, there are rare cases with no alterations in the ECG.*

The InterTAK criteria mention the occurrence of the syndrome in the postoperative period of heart surgery, that is, they do not confirm nor exclude the diagnosis of the Takotsubo Syndrome in this case; however, with the increase in the number of cases reported in the literature, these criteria have been used for diagnoses in these groups of patients.⁸ Findings from Fundao et al. suggest that, for future updates of the diagnostic criteria, one should consider the inclusion of heart surgery as a trigger for Takotsubo Syndrome.⁸

The differential diagnosis should mainly include acute coronary syndromes, since cardiomyopathies caused by stress overlap with acute coronary syndromes in their clinical and electrocardiographic manifestations.³ In this scenario, in which the patient develops a cardiogenic shock in the postoperative period of heart surgery with acute alterations in the electrocardiogram and a left ventricle dysfunction with an anomalous movement of the wall, the first possibility to be discarded is coronary disease.⁹

In myocardialopathy caused by stress, the left ventricular function returns to normal within a few weeks; however, some complications can occur before fully recovering the ventricular systolic function. The main complications include: cardiogenic shock, obstruction of the left ventricular

outflow, arrhythmias, systemic thromboembolism, and intramyocardial rupture.³

Treatment of the Takotsubo Syndrome is controversial, since no randomized prospective clinical trials have been conducted on the theme. Thus, the treatments are based on clinical experience and the consensus of specialists. One of the main questions in the treatment is to determine the presence or absence of the obstruction of the left ventricular outflow, which can change the therapeutic approach. The detection of the obstruction of left ventricular outflow is generally achieved through echocardiography or hemodynamic measures during the cardiac catheterization.² In the case reported here, the obstruction of the left ventricular outflow was discarded, and treatment using inotropics was implemented. Another possibility would be the temporary use of the intra-aortic balloon to minimize the use of inotropics, which was not necessary in the present case.

Conclusion

The Takotsubo Syndrome should be remembered as a rare complication in the context of cardiogenic shock during the postoperative period of cardiovascular surgery. This syndrome stems from conditions directly related to stress factors, with an abrupt rise in catecholamine levels. The characteristic echocardiographic standard, associated with the clinical scenario presented above, can aid in the diagnostic definition.

There are still many aspects concerning Takotsubo Syndrome that are still not fully understood. Clinical research is necessary to evaluate the treatment strategies in the acute stage and their impacts upon the patients' recovery of their ventricular function.

Author Contributions

Conception and design of the research, acquisition of data, analysis and interpretation of the data, writing of the manuscript and critical revision of the manuscript for intellectual content: Maia AS, Leão GS, da Mota JG, Filgueiras DTB, Rodrigues VN, Minuzzo L, Issa M.

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Ethics Approval and Consent to Participate

This article does not contain any studies with human participants or animals performed by any of the authors.

Case Report

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