# Late Evolution of Takotsubo Cardiomyopathy Following Transcatheter Aortic Valve Implantation

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## Introduction

Transcatheter aortic valve implantation (TAVI) is recognized as a first-line treatment for symptomatic patients with advanced aortic stenosis who are at high surgical risk. In inoperable patients with poor prognosis, it carries a risk for complications, such as myocardial infarction due to coronary occlusion, stroke, annular rupture, etc.[1] Takotsubo Cardiomyopathy (TTC) is a syndrome that usually develops in the absence of overt coronary occlusion and signs of alternative diagnosis, including myocarditis. It presents with electrocardiographic changes, increased cardiac biomarkers, and typical echocardiographic findings.[2,3] In this article, we describe a patient with TTC who previously underwent TAVI and subsequent implantable cardiac defibrillator (ICD) implantation.

## Case report

A 77-year-old woman was admitted with symptoms of shortness of breath and wheezing. Physical examination demonstrated a blood pressure value of 111/76 mmHg, respiratory rate of 28/min, pulse rate of 70 bpm, and oxygen saturation of 88%. Cardiovascular examination exhibited a pattern of left-sided apical impulse, 2-3/6 systolic murmur, and bilateral 2 + pitting edema of lower limbs. Examination of the lungs revealed bilateral rales up to the middle zones. Left ventricular ejection fraction (LVEF) value was 42%. The left ventricular apex was akinetic, suggesting a pattern of apical ballooning. High sensitive-troponin and brain natriuretic peptide (BNP) levels on admission were 256 ng/l (normal range: 0-19 ng/l) and 114.3 pg/ml (normal range: 0-100 pg/ml), respectively. The patient's detailed anamnesis included hypertension and TAVI performed due to aortic stenosis four months ago. After TAVI, a complete atrioventricular block persisted in the patient, and non-sustained VT was observed in the follow-up. For this reason, the patient was implanted with an ICD instead of a permanent pacemaker. In the transthoracic echocardiography performed after TAVI, LVEF was calculated as 55% and left ventricular systolic functions were normal. No pericardial effusion or paravalvular leakage was observed in the implanted aortic valve. The patient, who had no complaints, no physical examination findings, and no deterioration in laboratory parameters, was called for a cardiology outpatient clinic control and then discharged. After detailed evaluation, the patient was hospitalized with the prediagnoses of acute coronary syndrome and decompensated heart failure. Coronary angiography performed after urgent stabilization of the patient revealed no critical stenosis in the coronary arteries (Figure 1). Subsequent cardiac magnetic resonance imaging excluded acute myocarditis and revealed a pattern of global hypokinesia with severe apical and mid-ventricular involvement (Figure 2). Based on these findings, TTC was considered as the most likely diagnosis. Following successful management, she was discharged uneventfully under acute coronary syndrome and heart failure medications. An outpatient visit was planned for the patient following one month. During the scheduled cardiology outpatient clinic visit, the patient's complaints related to heart failure disappeared after medical treatment. In the transthoracic echocardiography, it was seen that the left ventricular contractions returned to normal, and LVEF was calculated as 50%. The patient continues to be followed up with medical treatment.

## Discussion

TC was first described in 1991, and it was generally considered to occur due to emotional or physical triggers, including mourning, trauma, sepsis or metabolic abnormalities.[2,4] It is known that high catecholamine levels associated with these triggers play a pivotal role in its pathogenesis.[2,5] The findings that prompted us to make the diagnosis of TTC, in this case, were the presence of specific abnormalities in left ventricular wall motion beyond a single arterial perfusion zone, absence of occlusive coronary artery disease, increased cardiac troponin levels, and absence of findings in favor of myocarditis.[2]

Acute coronary syndromes and arrhythmias may develop frequently after TAVI.[1] Most of the acute cardiomyopathies occurring after TAVI may be due to occlusive coronary artery disease.[1] TAVI is a less invasive procedure compared to cardiac surgery but may cause severe emotional and/or physical stress in high-risk patients, potentially leading to TTC evolution. However, in the present case, TTC emerged long after TAVI, potentially indicating the null impact of procedure-related stress on TTC evolution. However, TTC (in the form of apical ballooning) was also previously suggested to occur as a consequence of mechanical factors,

## Keywords

Takotsubo Cardiomyopathy;Transcatheter Aortic Valve Replacement; Echocardiography

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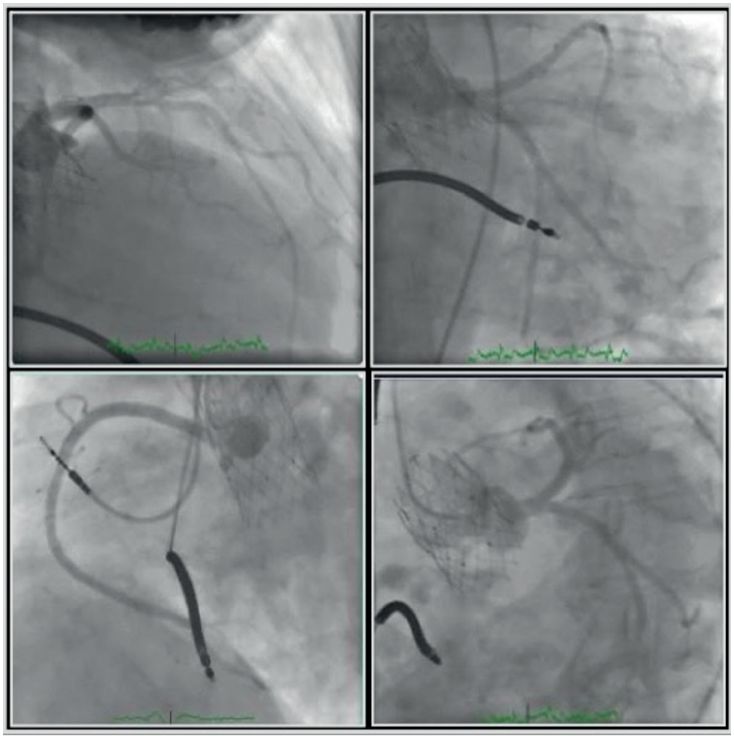

**Figure 1 –** *Non-occlusive coronary arteries, TAVI device, and ICD leads on coronary angiogram.*

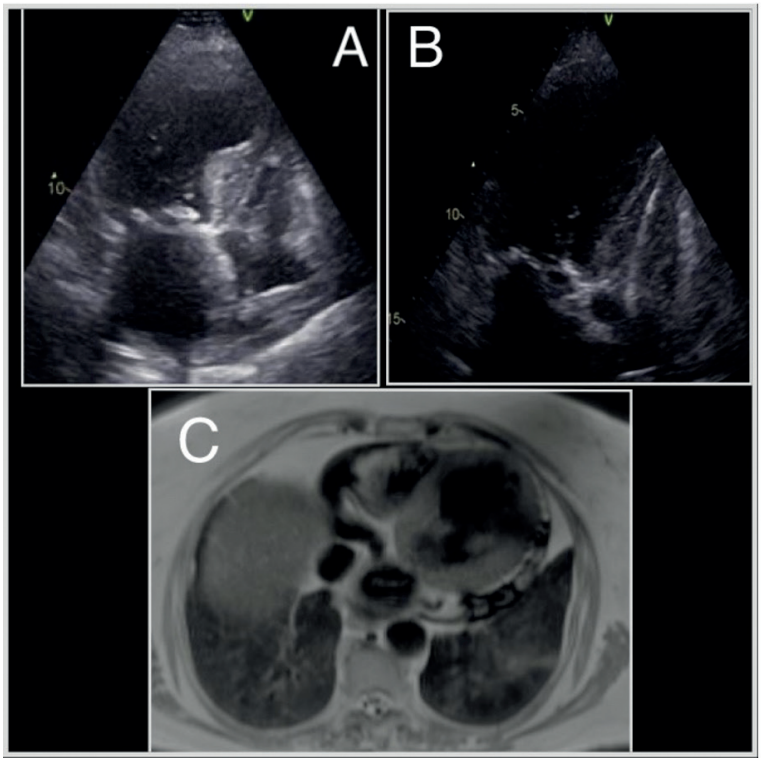


**Figure 2 –** *A-B: Transthoracic echocardiogram demonstrating left ventricular apical ballooning and lead image in the right chambers on apical four-chamber view C: Apical ballooning on cardiac MRI.*

including acute intraventricular gradient, possibly due to afterload mismatch in patients with a modest degree of pre-existing left ventricular hypertrophy.[3,6] Accordingly, our case might have possibly incurred acute midventricular or outflow tract gradient due to certain mechanical factors, including enhanced contractility and reduced preload or afterload,[3] most of which might, to some extent, be associated with the relief of aortic valve stenosis following TAVI. However, this notion remains speculative, and certain tests, including dobutamine stress echocardiogram, are required to reveal provoked intraventricular gradient[3] in our patient. To date, TTC, regardless of the underlying actual trigger, has been rarely reported following TAVI.[7] The present case might be regarded as an epitome of late TTC evolution following TAVI.

## Author Contributions

Conception and design of the research, acquisition of data, analysis and interpretation of the data, statistical analysis, writing of the manuscript and critical revision of the manuscript for intellectual content: Çakır MA, Çakır E, Kaya Ç, Yalta K.

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### Study Association

This study is not associated with any thesis or dissertation work.

### Ethics Approval and Consent to Participate

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

## References

1. Yalta K, Kaya Ç, Aksoy Y, Yılmaztepe M, Kardaş F. Acute Myocardial Infarction Shortly after Valve-in-Valve Transcatheter Aortic Valve Implantation Successfully Managedwith Challenging Percutaneous Coronary Intervention. Turk Kardiyol Dern Ars. 2018;46(1):61-5. doi: 10.5543/tkda.2017.03256.
2. Yalta K, Madias JE, Kounis NG, Y-Hassan S, Polovina M, Altay S, et al. Takotsubo Syndrome: An International Expert Consensus Report on Practical Challenges and Specific Conditions (Part-1: Diagnostic and Therapeutic Challenges). Balkan Med J. 2024;41(6):421-41. doi: 10.4274/balkanmedj.galenos.2024.2024-9-98.
3. Yalta K, Madias JE, Kounis NG, Y-Hassan S, Polovina M, Altay S, et al. Takotsubo Syndrome: An International Expert Consensus Report on Practical Challenges and Specific Conditions (Part-2: Specific Entities, Risk Stratification and Challenges after Recovery). Balkan Med J. 2024;41(6):442-57. doi: 10.4274/balkanmedj.galenos.2024.2024-9-99.
4. Zhang L, Piña IL. Stress-Induced Cardiomyopathy. Heart Fail Clin. 2019;15(1):41-53. doi: 10.1016/j.hfc.2018.08.005.
5. Ghadri JR, Wittstein IS, Prasad A, Sharkey S, Dote K, Akashi YJ, et al. International Expert Consensus Document on Takotsubo Syndrome (Part I): Clinical Characteristics, Diagnostic Criteria, and Pathophysiology. Eur Heart J. 2018;39(22):2032-46. doi: 10.1093/eurheartj/ehy076.
6. Yalta K, Kaya C, Yalta T. Left Ventricular Aneurysm Formation in Patients with Takotsubo Syndrome: A Peculiar Phenomenon with Subtle Implications. Kardiol Pol. 2023;81(10):1034-5. doi: 10.33963/KP.a2023.0161.
7. Harhash A, Koulogiannis KP, Marcoff L, Kipperman R. Takotsubo Cardiomyopathy after Transcatheter Aortic Valve Replacement. JACC Cardiovasc Interv. 2016;9(12):1302-4. doi: 10.1016/j.jcin.2016.04.017.