Case Report

Takotsubo Cardiomyopathy: A Case of Young Male with Broken Heart

Abdul Rehman Mughal¹, Muhammad Uzair Mughal², Fizza Uzair Mughal³, Iqra Riaz Mughal⁴, Rida Fatima Mughal⁴, Muhammad Naeem Mughal³

¹ Riphah College of Rehabilitation Sciences, Riphah International University, Lahore, Pakistan
² Islam Central Hospital, Sialkot, Pakistan
³ Islam Medical and Dental College, Sialkot, Pakistan
⁴ Allama Iqbal Memorial Teaching Hospital, Sialkot, Pakistan

*Corresponding Author: abdul.rehman@uskt.edu.pk

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Abstract

Intubation and mechanical ventilation are essential life-saving measures for critically ill patients. However, these interventions can have unfavorable outcomes, particularly in high-risk individuals predisposed to certain critical events. Takotsubo cardiomyopathy (TC) is a temporary condition that affects the heart’s pumping function and is often triggered by severe stress. It resembles acute coronary syndrome (ACS) but is reversible with appropriate management. This case report aims to present a unique instance of a young male developing Takotsubo cardiomyopathy following intubation and mechanical ventilation due to status asthmaticus. The report emphasizes the importance of recognizing potential complications associated with mechanical ventilation and the necessity for timely diagnosis and management to ensure favorable outcomes. The study was conducted at a tertiary care hospital involving a single case of a 32-year-old male with a history of bronchial asthma. Upon arrival at the emergency department, the patient was unresponsive, with no spontaneous breathing or carotid pulse, and was immediately intubated following cardiopulmonary resuscitation (CPR). Initial assessments included complete blood count (CBC), renal function tests (RFTs), liver function tests (LFTs), cardiac enzymes, and an electrocardiogram (ECG). Arterial blood gases (ABGs) were measured to assess respiratory status. Serial troponin levels were monitored, and echocardiography was performed. Ethical approval was obtained, and data analysis was conducted using IBM SPSS Statistics for Windows, Version 25.0, with descriptive statistics and paired t-tests used to assess changes in clinical parameters. The patient’s arterial blood gases showed marked respiratory acidosis (pH 6.90), hypoxia (PO2 40 mmHg), and hypercapnia (PCO2 100 mmHg). Troponin levels were elevated, with initial measurements at 1354.4 ng/L, increasing to 2134.1 ng/L at 12 hours. ECG revealed ST elevation in leads V₁-V₄. Echocardiography indicated apical and interventricular segment hypokinesia with a reduced ejection fraction. Coronary angiography showed normal coronary arteries, confirming TC. The patient’s condition improved with inotropic support, and he was weaned off mechanical ventilation by the third day. Follow-up echocardiography two weeks later showed normal ejection fraction and wall motion. Takotsubo cardiomyopathy can occur in young males following significant physiological stress such as intubation and mechanical ventilation. Early recognition and appropriate management are crucial for full recovery. This case highlights the need for awareness of TC in critical care settings to prevent misdiagnosis and ensure optimal patient outcomes.

1 Introduction

Takotsubo cardiomyopathy (TC), often referred to as broken heart syndrome, stress cardiomyopathy, or apical ballooning syndrome, is characterized by a temporary impairment of the heart’s pumping function and hypokinesia of its musculature. This condition was first described by Sato et al. in Japan in 1990, deriving its name from the Japanese terms “tako” (octopus) and “tsubo” (pot) due to the heart’s resemblance to an octopus pot used by fishermen (1). Clinically, TC mimics acute coronary syndrome (ACS) with patients presenting with similar symptoms, including chest pain, dyspnea, and electrocardiogram (ECG) changes such as ST elevation, along with elevated cardiac enzymes. However, unlike ACS, coronary angiography typically reveals no significant obstructive coronary artery disease (2). The condition is notably more prevalent in females, particularly those over the age of 50, often triggered by intense emotional or physical stress (3). Despite its similarity to ACS in terms of presentation, the hallmark of TC is its transient nature and complete reversibility with appropriate management. This reversibility underscores the importance of distinguishing TC from other forms of cardiomyopathy and ACS to avoid unnecessary thrombolytic therapy, which poses a risk of hemorrhage in these patients (4). Intubation and mechanical
ventilation, common life-saving procedures performed in emergency and intensive care settings, have been documented to occasionally precipitate TC, although such cases are rare. To date, there have been no reported cases of TC following intubation and mechanical ventilation in our hospital setup, marking the uniqueness of our case report.

Our case involves a young male patient with a known history of bronchial asthma, presenting with severe status asthmaticus requiring intubation and mechanical ventilation. This case not only highlights the critical need for healthcare professionals, especially those working in emergency and intensive care units, to be aware of such rare but reversible conditions but also emphasizes the importance of timely diagnosis and management to ensure full recovery and minimal adverse effects. The pathophysiological mechanisms underlying TC are not fully understood, but it is believed to involve a complex interplay of catecholamine-induced myocardial stunning, microvascular dysfunction, and coronary artery spasm (5). The increasing recognition of TC has led to its inclusion in the American Heart Association’s classification of cardiomyopathies in 2006, signifying its importance in the spectrum of cardiovascular diseases (6).

2 Material and Methods
This study was conducted at a tertiary care hospital and involved a single case of a young male patient diagnosed with Takotsubo cardiomyopathy (TC) following intubation and mechanical ventilation due to status asthmaticus. The patient, a 32-year-old male with a known history of bronchial asthma, presented to the emergency department in an unresponsive state with a Glasgow Coma Scale (GCS) score of 3/15. Upon arrival, the patient exhibited no spontaneous breathing or carotid pulse, prompting immediate cardiopulmonary resuscitation (CPR) in accordance with Advanced Cardiovascular Life Support (ACLS) protocols. Following 25 minutes of CPR, return of spontaneous circulation (ROSC) was achieved. The patient was then intubated to secure the airway and maintain oxygen saturation. Initial assessments included complete blood count (CBC), renal function tests (RFTs), liver function tests (LFTs), cardiac enzyme levels, and an electrocardiogram (ECG). Arterial blood gases (ABGs) indicated marked respiratory acidosis and hypoxia. On the second day in the intensive care unit (ICU), the patient’s bronchospasm and blood gases showed improvement; however, he developed hypotension that did not respond to intravenous fluids, necessitating the initiation of inotropic support. Routine ICU assessments, including a chest X-ray to rule out tension pneumothorax and a 12-lead ECG, revealed ST elevation in the chest leads (V1–4), alongside increasing troponin-I levels measured at 0, 6, and 12 hours.

A transthoracic echocardiogram performed at the bedside revealed apical and interventricular segment hypokinesia with a reduced ejection fraction. Given these findings, the patient was transferred to the catheterization laboratory for coronary angiography, which demonstrated non-obstructive coronary vessels. The combination of ECG changes, elevated cardiac enzymes, and hypokinetic changes on echocardiography with normal coronaries confirmed the diagnosis of TC, likely precipitated by recent intubation and mechanical ventilation. The patient’s bronchospasm and hypotension subsequently improved, allowing for the tapering off of inotropic support. By the third day, the patient was weaned off mechanical ventilation and transferred to the pulmonology ward on the fifth day. Follow-up ECGs showed resolution of ST elevation, and repeat echocardiography two weeks later indicated normal ejection fraction and wall motion. Ethical approval for this case report was obtained from the hospital’s ethical review board, and the study was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from the patient for publication of this case report and any accompanying images. Data were collected retrospectively from the patient’s medical records and included demographic information, clinical presentation, laboratory and imaging results, and treatment outcomes (7,8).

Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 25.0. Descriptive statistics were used to summarize the characteristic and outcomes of the patient. Continuous variables were presented as means and standard deviations, while categorical variables were presented as frequencies and percentages. The significance of changes in clinical parameters was assessed using paired t-tests, with a p-value of less than 0.05 considered statistically significant.

This case report underscores the importance of recognizing and managing TC in patients undergoing intubation and mechanical ventilation, highlighting the need for heightened awareness among healthcare professionals to ensure timely and effective treatment (1).

3 Case Presentation
The patient, a 32-year-old male with a history of bronchial asthma, presented to the emergency department unresponsive, with a GCS score of 3/15, no spontaneous breathing, and no carotid pulse. Immediate CPR was initiated according to ACLS protocols, and ROSC was achieved after 25 minutes. The patient was then intubated and mechanical ventilation was initiated. Baseline investigations, including CBC, RFTs, LFTs, cardiac enzymes, and ECG, were conducted.
Table 1. Initial Laboratory and Imaging Findings

<table>
<thead>
<tr>
<th>Investigation</th>
<th>Findings</th>
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<tbody>
<tr>
<td><strong>Arterial Blood Gases (ABGs)</strong></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>6.90 (7.34-7.45)</td>
</tr>
<tr>
<td>PO2</td>
<td>40 mmHg (35-45)</td>
</tr>
<tr>
<td>PCO2</td>
<td>100 mmHg (90-100)</td>
</tr>
<tr>
<td>HCO3</td>
<td>23.9 mmol/L (22-24)</td>
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<tr>
<td><strong>Cardiac Enzymes</strong></td>
<td></td>
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<tr>
<td>Troponin at 0 hours</td>
<td>1354.4 ng/L (&lt;10 ng/L)</td>
</tr>
<tr>
<td>Troponin at 6 hours</td>
<td>1493.8 ng/L</td>
</tr>
<tr>
<td>Troponin at 12 hours</td>
<td>2134.1 ng/L</td>
</tr>
<tr>
<td><strong>Coronary Angiography</strong></td>
<td>Normal coronaries</td>
</tr>
</tbody>
</table>

The initial ABGs showed marked respiratory acidosis and hypoxia. On the second day, despite improvements in bronchospasm and blood gases, the patient developed hypotension that was unresponsive to intravenous fluids, requiring inotropic support. Routine ICU assessments, including a chest X-ray, showed hyperinflated lungs without pneumothorax. The 12-lead ECG revealed ST elevation in leads V1-V4, and serial troponin measurements indicated a rising trend.

**ECG Findings**

Image I: Electrocardiogram in the emergency department showing initial findings.

Image II: ECG on the second day of hospital admission showing ST elevation in leads V1-V4.

Image III: ECG after one week showing resolution of ST elevation.

**Echocardiography and Coronary Angiography**

A transthoracic echocardiogram performed at the bedside in the ICU showed apical and interventricular segment hypokinesia with a decreased ejection fraction. Coronary angiography demonstrated non-obstructive coronary vessels, confirming the diagnosis of TC.

**Clinical Course and Outcome**

The patient’s bronchospasm and hypotension improved, allowing for the tapering off of inotropic support. By the third day, the patient was successfully weaned off mechanical ventilation and was transferred to the pulmonology ward on the fifth day. His ECG returned to normal by the time of transfer. Follow-up echocardiography two weeks later showed a normal ejection fraction and wall motion, indicating full recovery.

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The patient’s course was uneventful following ICU discharge, and he remained stable during his hospital stay. Optimization of his asthma medications was performed, and he was discharged in good condition. The patient continues to do well on follow-up, with no recurrent symptoms or complications.

This case highlights the importance of recognizing TC in patients undergoing intubation and mechanical ventilation and underscores the necessity for timely diagnosis and appropriate management to ensure complete recovery and prevent adverse outcomes.

**4 Discussion**

The discussion of this case centers on the unique presentation of Takotsubo cardiomyopathy (TC) in a young male patient following intubation and mechanical ventilation due to status asthmaticus. This case underscores the importance of early recognition and differentiation of TC from other acute cardiac events, particularly acute coronary syndrome (ACS), given their overlapping clinical features. The transient nature of TC, characterized by reversible left ventricular dysfunction and apical ballooning, necessitates a high index of suspicion, especially in the context of stressors such as severe asthma exacerbation and invasive procedures (9,10).

Previous studies have documented the predominance of TC in older females, typically triggered by significant emotional or physical stress (3,11). However, this case adds to the growing body of evidence suggesting that TC can occur in younger males and be precipitated by physiological stressors such as intubation and mechanical ventilation. The pathophysiological mechanisms underlying TC are believed to involve a surge in catecholamines, leading to myocardial stunning, microvascular dysfunction, and coronary artery spasm (5,12). This case aligns with these theories, as the patient experienced severe respiratory distress and subsequent mechanical intervention, which likely contributed to the development of TC.

The patient's clinical presentation, marked by ST elevation on ECG, elevated cardiac enzymes, and echocardiographic findings of hypokinesia with normal coronary arteries, was consistent with TC. This underscores the critical need for coronary angiography to distinguish TC from ACS, as misdiagnosis can lead to inappropriate management, such as unnecessary thrombolytic therapy, which carries a risk of haemorrhage (13,14). The timely diagnosis and management in this case, facilitated by a multidisciplinary approach, led to a favourable outcome with full recovery of cardiac function.

One of the strengths of this case report is the detailed chronological documentation of the patient’s clinical course, from initial presentation to follow-up, providing a comprehensive overview of TC management in an acute setting. The use of serial cardiac enzyme measurements, ECG monitoring, and echocardiography highlights the importance of these diagnostic tools in monitoring disease progression and recovery. Additionally, this case contributes to the limited literature on TC in young males and its association with mechanical ventilation, thereby expanding the understanding of potential triggers and risk factors for this condition (15-17).

However, there are limitations to this case report. As a single case study, the findings cannot be generalized to a broader population. The absence of long-term follow-up beyond the initial recovery period limits the understanding of potential late recurrences or complications associated with TC. Furthermore, while the patient’s non-compliance with asthma medication was noted, the impact of chronic asthma management on the development of TC was not explored in depth.

Considering these observations, it is recommended that healthcare providers maintain a high level of vigilance for TC in patients undergoing significant physiological stress, including those requiring intubation and mechanical ventilation. Future research should focus on larger cohort studies to better understand the incidence, risk factors, and long-term outcomes of TC in diverse populations. Additionally, exploring the role of chronic disease management in preventing stress-induced cardiomyopathy could provide valuable insights into comprehensive patient care strategies.
5 Conclusion
In conclusion, this case highlights the reversible nature of Takotsubo cardiomyopathy when promptly diagnosed and managed. The rarity of TC in young males post-intubation underscores the need for heightened awareness and consideration of this diagnosis in similar clinical scenarios. Enhanced understanding and recognition of TC can lead to better patient outcomes and prevent potential complications associated with misdiagnosis.

6 References
**Disclaimers**

**Author Contributions**
Abdul Rehman Mughal conceptualized and designed the study. Muhammad Uzair Mughal conducted data collection and analysis. Fizza Uzair Mughal and Iqra Riaz Mughal interpreted the results. Rida Fatima Mughal and Muhammad Naeem Mughal drafted the manuscript.

**Conflict of Interest**
The authors declare that there are no conflicts of interest.

**Data Availability**
Data and supplements available on request to the corresponding author.

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**Ethical Approval**
Islam Central Hospital, Sialkot, Pakistan

**Trial Registration**
NA

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NA

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