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Case Report

Transient ST-Elevation Myocardial Infarction: A Case Report of Threat or Treat

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ABSTRACT

Background: Transient ST-elevation myocardial infarction (STEMI) is a rare and underrecognized subset of acute coronary syndrome. It is characterized by the spontaneous resolution of ST-segment elevation before any reperfusion intervention. Although this phenomenon may indicate a more favorable prognosis, the underlying coronary pathology often persists, which raises questions regarding optimal management strategies.

Case Presentation: A 56-year-old man with a history of dyslipidemia and chronic smoking presented with acute epigastric pain. The initial ECG showed no ischemic changes; however, a repeat ECG 1 hour later demonstrated transient ST-segment elevation in the inferior leads that resolved spontaneously within minutes. Despite the resolution, the patient underwent urgent coronary angiography, which revealed an occlusion of the mid–right coronary artery. Successful revascularization was achieved with primary percutaneous coronary intervention and drug-eluting stent placement. The patient recovered without complications, had preserved cardiac function on echocardiography, and was discharged on optimal medical therapy.

Discussion: This case exemplifies the diagnostic and therapeutic challenges associated with transient STEMI, a condition with features overlapping those of both STEMI and high-risk non-STEMI. Although the ST-segment elevation is transient, it may mask ongoing myocardial injury or a critical coronary obstruction. Despite spontaneous reperfusion, the risk of adverse outcomes remains significant. Evidence supports the use of an early invasive management strategy to mitigate myocardial damage and prevent recurrent ischemia.

Conclusion: Transient STEMI should not be dismissed as a benign condition. Prompt recognition, serial ECG monitoring, and early revascularization remain essential. Further research is needed to establish standardized diagnostic criteria and optimal treatment strategies for this unique presentation of acute coronary syndrome. ***(Iranian Heart Journal 2025; 26(4): 98-104)***

KEYWORDS: Myocardial infarction; STEMI; Percutaneous coronary intervention; Coronary artery disease; Case report

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ST-segment elevation may resolve spontaneously before revascularization, a phenomenon termed transient ST-elevation myocardial infarction (t-STEMI). The prevalence of t-STEMI is estimated to be 6% of all acute coronary syndrome cases and up to 25% of high-risk non–ST-elevation myocardial infarction (NSTEMI) cases. [1, 2] Despite presenting with ST-segment elevation, t-STEMI follows a clinical trajectory distinct from persistent STEMI, which often leads to uncertainty in classification and management. Although spontaneous resolution may suggest a more benign course, significant underlying coronary artery pathology often persists, necessitating a strategic approach to revascularization. In view of the ongoing debate regarding its classification and prognostic implications, t-STEMI remains a unique clinical entity that requires further investigation.

The proposed mechanism of t-STEMI involves spontaneous coronary reperfusion, which is likely mediated by increased endogenous fibrinolytic activity and may contribute to a more favorable prognosis than persistent STEMI. [3] Studies have shown that patients with t-STEMI tend to be younger and have fewer traditional cardiovascular risk factors, such as hypertension and diabetes, but a higher prevalence of smoking and dyslipidemia. [4, 5] Despite these seemingly protective factors, t-STEMI is not entirely benign. Recent data suggest that patients with t-STEMI may still experience adverse cardiovascular outcomes, including recurrent ischemic events, increased troponin release, and a potential need for subsequent coronary interventions. [1, 5] Accordingly, the optimal management strategy-whether to pursue immediate or delayed revascularization-remains a topic of ongoing clinical research.

We herein present a case of t-STEMI that was successfully managed with prompt percutaneous coronary intervention (PCI) to highlight the diagnostic challenges and underscore the significance of timely intervention.

CASE PRESENTATION

A 56-year-old man presented to the emergency department with sudden-onset epigastric pain that began 1 hour before arrival. The pain was intermittent, tight in nature, and radiated to the chest and lower back, resembling typical angina symptoms. The patient denied a history of hypertension or diabetes mellitus but reported dyslipidemia and chronic smoking at 1 pack per day.

Initial Diagnostic Workup

An initial ECG (Figure 1) showed sinus bradycardia at a rate of 55 beats/min, with no ST-elevation or ischemic changes. A chest radiograph (Figure 2) demonstrated clear lung fields and a normal cardiac silhouette. Laboratory tests revealed a mildly elevated troponin I level of 0.034 ng/mL (reference, < 0.02 ng/mL) and a CK-MB level of 2.64 ng/mL (reference, 0.34–4.99 ng/mL), which was within the normal range.

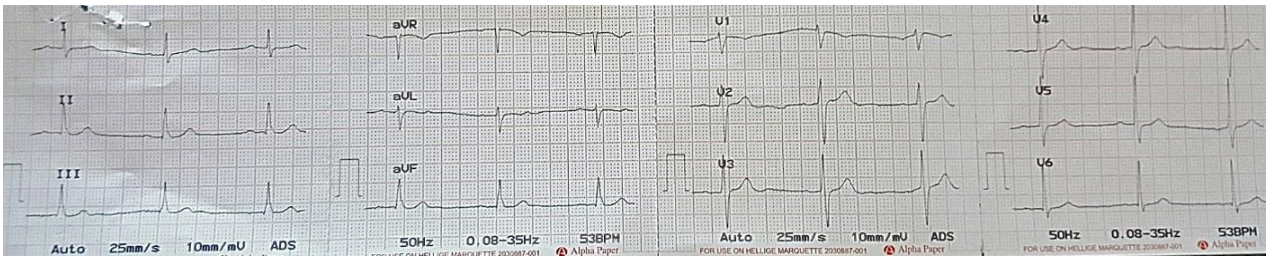

Figure 1. The image presents the initial ECG upon the patient's arrival at the emergency department.

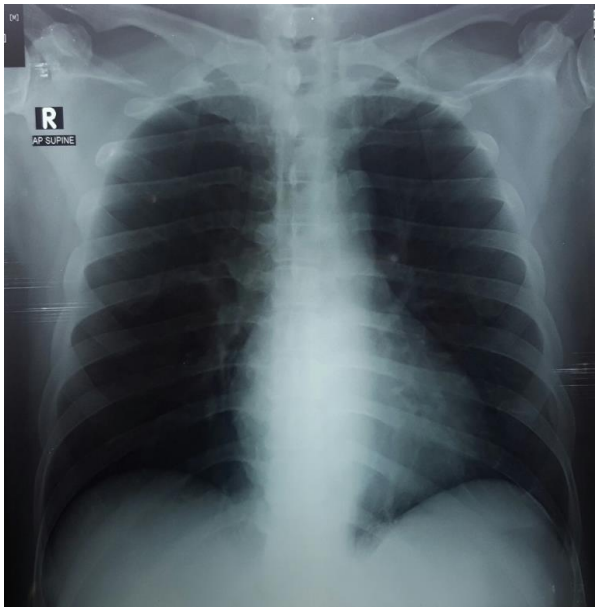

Figure 2. The patient's chest X-ray reveals clear lung fields and a normal cardiac silhouette.

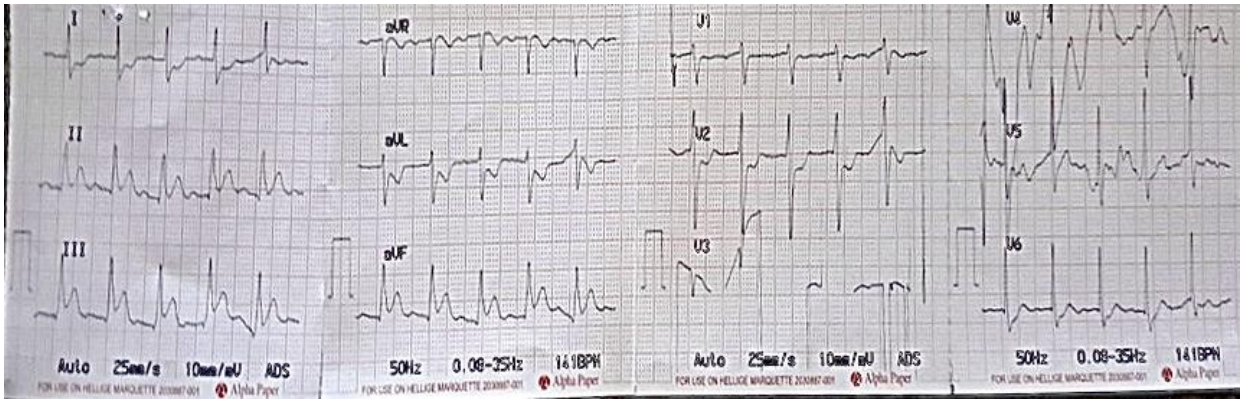

Figure 3. The patient's ECG 1 hour post-arrival at the emergency department is presented here.

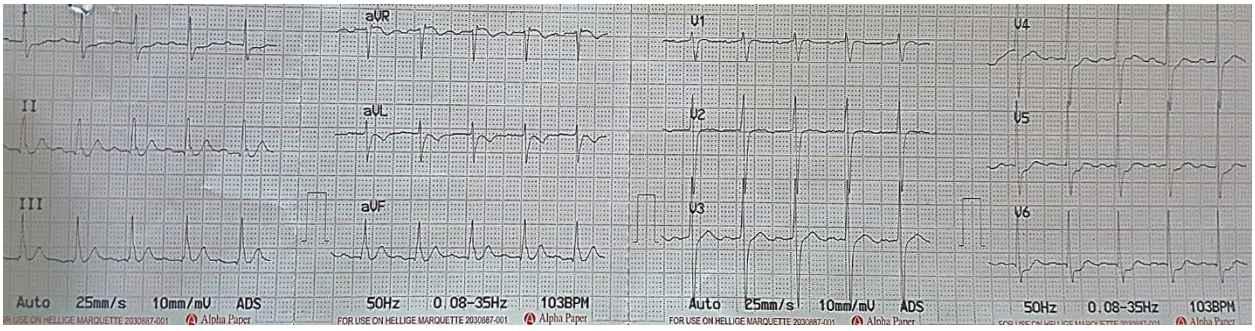

Figure 4. An ECG recorded 3 minutes after the previous tracing shows resolved ST-segment elevation without a pathologic Q wave.

The patient continued to experience abdominal discomfort, nausea, and vomiting, prompting a repeat ECG 1 hour later, which showed ST-elevation in leads II, III, and aVF, suggestive of inferior STEMI (Figure 3). Three minutes later, the patient's symptoms resolved spontaneously, and a subsequent ECG (Figure 4) demonstrated resolution of ST-elevation without pathologic Q waves.

Revascularization Strategy

Given the fluctuating ECG findings and transient ischemic symptoms, primary PCI was performed without delay. Coronary angiography revealed an occlusion in the mid-right coronary artery (Figure 5A). A drug-eluting stent was deployed, successfully restoring Thrombolysis in Myocardial Infarction (TIMI) grade III flow (Figure 5B). A post-PCI ECG demonstrated improvement in ischemic changes.

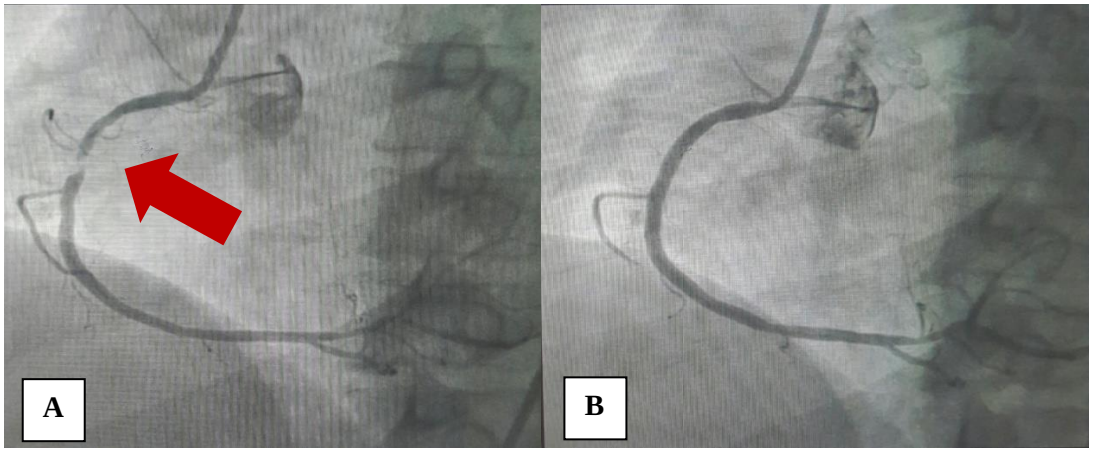

Figure 5. A) Coronary angiography shows a stenotic lesion in the mid–right coronary artery (red arrow). **B)** Post-percutaneous coronary intervention angiography shows restored Thrombolysis in Myocardial Infarction (TIMI) grade III flow following stent placement.

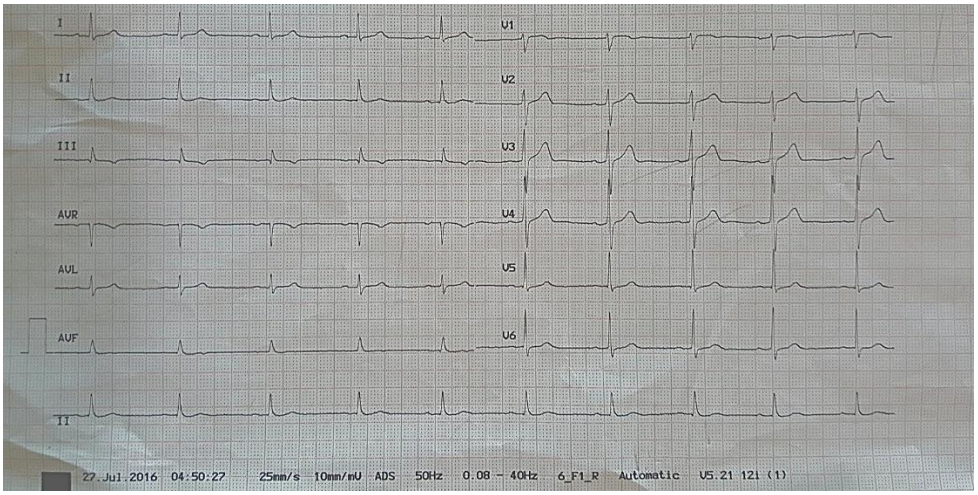

Figure 6. An ECG obtained on the day of the patient's discharge shows a normal sinus rhythm without ischemic changes.

Postprocedural Outcomes

The patient was monitored in the intensive care unit for 24 hours. Echocardiography performed 1 day after PCI showed no systolic or diastolic dysfunction, normal structural integrity, and normokinetic wall motion. A

final ECG on the day of discharge (Figure 6) was normal. The patient remained asymptomatic and was discharged in stable condition with ticagrelor, aspirin, atorvastatin, and trimetazidine. Comprehensive counseling on lifestyle modifications, including smoking cessation, was provided.

DISCUSSION

T-STEMI is a rare but clinically significant phenomenon characterized by spontaneous resolution of ST-elevation before revascularization. Despite its transient nature, current guidelines classify it as high-risk NSTEMI, warranting an early invasive approach to ensure timely reperfusion. [3] The underlying pathophysiology is believed to involve spontaneous coronary reperfusion, likely facilitated by endogenous fibrinolytic mechanisms, which may contribute to a more favorable prognosis compared with persistent STEMI. Nonetheless, the optimal management strategy remains a subject of debate.

Patients with t-STEMI generally present with different clinical profiles compared with those with persistent STEMI. They are typically younger, have lower rates of hypertension, and exhibit a higher prevalence of smoking and dyslipidemia. [3] In our case, the patient was a 56-year-old chronic smoker with dyslipidemia but no history of hypertension or diabetes, aligning with this characteristic profile. Although t-STEMI appears to be associated with fewer traditional cardiovascular risk factors, it remains a serious condition requiring careful evaluation and timely management.

One distinguishing feature of t-STEMI is its association with smaller infarct sizes, as reflected in lower troponin and creatine kinase-MB (CK-MB) levels. Cardiac magnetic resonance imaging studies have further confirmed minimal residual myocardial damage in these patients. [5, 6] In our case, the patient's normal CK-MB and only mildly elevated troponin levels suggested a limited infarct burden, supported by the absence of wall motion abnormalities on echocardiography and the lack of pathologic Q waves on follow-up ECG. This finding reinforces the hypothesis that spontaneous reperfusion may mitigate myocardial damage, potentially improving long-term outcomes.

The proposed mechanism behind spontaneous reperfusion in t-STEMI involves increased endogenous fibrinolytic activity. [7] Studies have shown that these patients exhibit a lower thrombus burden and reduced microvascular injury compared with those who have persistent STEMI, further distinguishing the two entities. Further, P2Y12 inhibitors have demonstrated no significant impact on microvascular injury in t-STEMI, reinforcing the concept that endogenous mechanisms, rather than pharmacologic intervention, play a primary role in restoring coronary perfusion. [8, 9] Despite these potential advantages, spontaneous reperfusion does not always ensure favorable outcomes, which underscores the importance of a structured revascularization strategy.

Although t-STEMI may appear less severe than persistent STEMI, the decision to delay intervention should be made with caution. The TRANSIENT trial reported no significant difference in major adverse cardiovascular events between immediate and delayed PCI strategies. Nevertheless, patients who underwent delayed intervention had higher troponin levels and were more likely to require coronary artery bypass grafting, suggesting that early revascularization may still be preferable in select cases. [10] Given the unpredictable nature of t-STEMI and the critical role of timely reperfusion, an individualized approach should be adopted. Factors such as patient risk profile, institutional capabilities, and overall clinical stability should be

carefully considered when determining the optimal timing for intervention. [8, 9]

Ultimately, t-STEMI remains a complex entity that requires further investigation to refine its classification and treatment strategies. Although spontaneous resolution of ST-elevation may suggest a more favorable prognosis, underlying coronary pathology often persists, necessitating vigilant monitoring and timely revascularization to optimize outcomes. This case highlights the importance of early recognition and appropriate management of t-STEMI to prevent potential complications. Although the resolution of ST-elevation may reflect spontaneous reperfusion, the risk of recurrent ischemic events, residual coronary artery disease, or future adverse cardiovascular events remains. A comprehensive assessment, including serial ECGs, biomarker monitoring, and imaging, is essential to guide clinical decision-making. Furthermore, prompt revascularization should still be considered, as delaying intervention may lead to higher troponin levels and an increased need for surgical intervention, as reported in previous studies. [3, 5, 10]

CONCLUSIONS

T-STEMI represents a unique clinical challenge due to its fluctuating presentation and uncertain prognosis. Although spontaneous resolution of ST-segment elevation may suggest a more benign course, underlying coronary artery disease often persists, which necessitates a cautious yet proactive management strategy. This case reinforces the need for early recognition, continuous monitoring, and prompt revascularization when appropriate to minimize myocardial damage and reduce the risk of future adverse cardiac events. Considering the evolving understanding of this condition, further research is needed to refine classification criteria, optimize treatment protocols, and determine the long-term prognostic implications. Ultimately, a tailored, patient-centered approach that integrates clinical assessment, imaging findings, and timely intervention is crucial for ensuring the best possible outcomes for patients with t-STEMI.

Ethical Approval and Informed Consent: The authors declare that this work adheres to ethical standards and guidelines. Written informed consent for publication was obtained from the patient.

Conflict of Interest: The authors have no conflicts of interest to disclose.

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