Case Report

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Management of STEMI with Complete Heart Block Using Transcutaneous Pacing: Case Report

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ABSTRACT

Background: *Transcutaneous cardiac pacing is a rapid, non-invasive method for stimulating the heart through skin electrodes and is vital in managing life-threatening Bradyarrhythmia. This case report highlights its role in a patient with severe arrhythmia following myocardial infarction.*

Case Presentation: *A 53-year-old male presented to the emergency department with chest pain. His condition progressed from STEMI to a third-degree atrioventricular (AV) block, which led to cardiac arrest. Transcutaneous pacing stabilized the patient, allowing time for coronary intervention. Following revascularization, the AV block resolved completely, and the patient recovered without residual conduction disturbances.*

Conclusion: *Prompt recognition and management of third-degree AV block in patients with ST-elevation myocardial infarction is essential. Emergency transcutaneous pacing, followed by timely coronary intervention, can be life-saving and restore normal cardiac conduction.*

Keywords: case report, third-degree AV block, transcutaneous pacing, PCI, STEMI

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1. Introduction

Ischemic heart disease is the root cause of about 40% of all AV blocks. Both acute and chronic ischemic heart disease may result in the development of an AV block, with rates of high-degree AV block ranging from 2.7% to 14.0%. Conduction blocks in the presence of anterior myocardial infarction are less frequent but are associated with a worse prognosis. [(1)]

Severe circulatory failure that causes substantial in-hospital mortality, associated morbidity, and financial burden is known as cardiogenic shock. Atrial and ventricular arrhythmias are most likely to occur in patients experiencing cardiogenic shock. [(2)]

Two potentially fatal consequences of acute ST-segment elevation myocardial infarction (STEMI) are ventricular tachycardia (VT) and ventricular fibrillation (VF). Previous research indicates that 5% to 10% of individuals with acute STEMI experience VT, with two-thirds of instances occurring before reperfusion and 90% during the first 48 hours following infarction. [(3)]

In general, the presence of a high-degree complete (A-V) block in acute myocardial infarction is reported at 1.5-13%. Acute myocardial infarction complicated by A-V block has a much higher predictor of mortality rates than cases without block. [(4)]

2. Case report

A 53-year-old male hypertensive patient from Addis Ababa on medical management presented to our hospital's emergency department with a 48-hour history of sharp and crushing-type chest pain radiating to the left arm and jaw. The patient also had associated diaphoresis and nausea. Medical history was only significant for hypertension. Upon presentation to the ED, his blood pressure was 60/40 mmHg, pulse rate was 38 beats per minute (bpm), respiratory rate was 22 breaths/minute, body temperature was 36.0 °C, and oxygen saturation was 95% while breathing ambient air. He had cold extremities. Because of cardiogenic shock and unstable symptomatic bradycardia with hemodynamic instability, management was initiated according to adrenalin infusion. While the patient was started on an adrenaline infusion, he developed sudden cardiac arrest with asystole as the arrest rhythm. Cardiopulmonary resuscitation (CPR) was immediately initiated and continued in accordance with advanced cardiac life support guidelines. The patient underwent five episodes of cardiac arrest, and return of spontaneous circulation (ROSC) was achieved after approximately 10 minutes. Following ROSC, the blood pressure was unrecordable, and the pulse rate was 32 beats per minute. Thus, the patient was put on a transcutaneous pacemaker with a rate of 80beats/min and capture current of 40 milliampere (MA). Subsequently, the patient experienced another 3 episodes of cardiac arrest, for which CPR was done, and the capture current was escalated to 80MA, and the pacer rate was increased to 100 B/min. The patient was intubated on the second cycle of cardiac arrest and was put on Adrenaline and Noradrenaline infusion. Dobutamine was added once the BP reached to 90/60, since he was having an estimated EF OF 10-15 % with anterolateral wall akinesis. The patient was on continuous sedation with midazolam and fentanyl infusion. Concurrently, laboratory tests were conducted, and the findings are shown in Table 1.

Electrocardiogram (ECG) on admission showed ST-segment elevation in leads V1–6 (Fig. 1). Echocardiography revealed anterior wall akinesis and ejection fraction (EF) of 10-15%. He was diagnosed as having anterolateral STEMI, and management started after stabilization. After stabilization, the patient went to the CAT-

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LAB (fig. 3), where Coronary angiography via right femoral approach was performed, revealing a type III vessel with 99.5% stenosis of the mid LAD segment, with fresh thrombus. PCI was performed, and the patient was transferred to the ICU. During follow-up at the ICU, the patient developed ventricular tachycardia twice (Fig. 2) and was successfully managed with amiodarone. After two weeks of ICU stay, the ECG became sinus rhythm, and after one week of ward stay, the patient was discharged improved with follow-up after being initiated on guideline-directed medical therapy with the diagnosis of heart failure with reduced ejection fraction. At the follow-up visit one month after discharge, the patient showed significant improvement in ejection fraction, which increased to 35-40%.

Table 1: Laboratory profile of the patient during emergency and intensive care unit care

Laboratory Test	Day 1	Day 2	Day 4	Day 7
WBC(×10³/µL)	4.5	7.6	8	6
HGB(g/dL)	13	13.1	12	14.2
BUN (mg/dL)	84	76	80	33
Creatinine (mg/dL)	2.2	2.4	2	1.2
AST (IU/L)	62	60	57	46
ALT (IU/L)	48	55	44	36
High-sensitivity Troponin (ng/mL)	>50	43	26	20

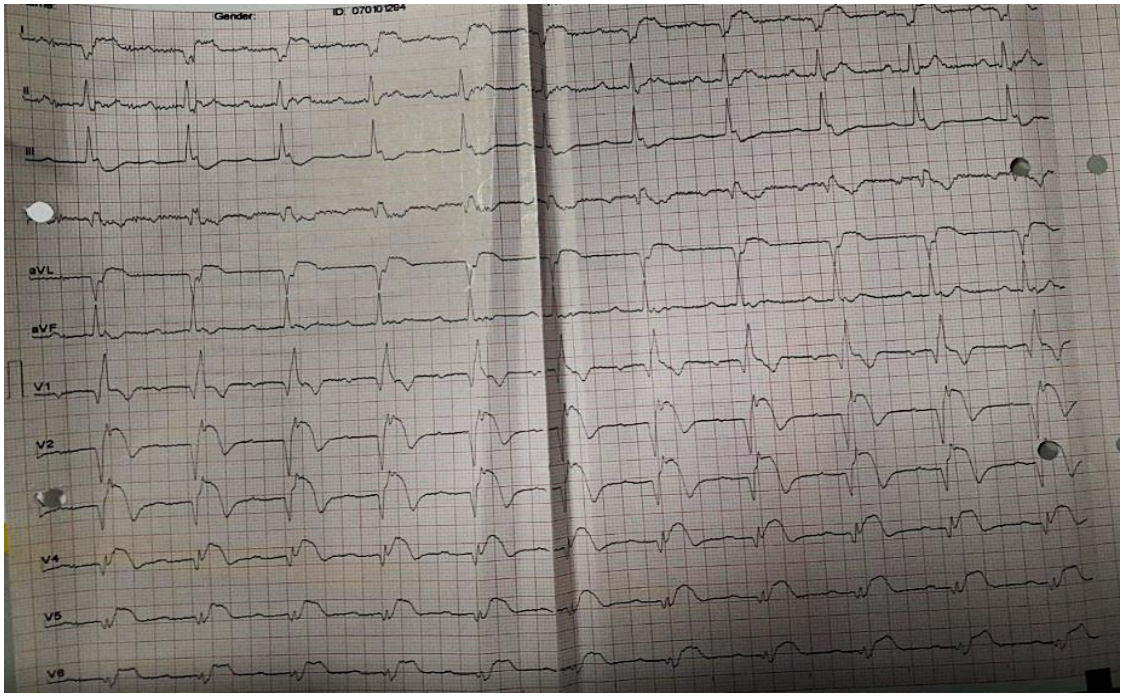

Fig 1: The patient's ECG shows anterolateral STEMI, with ST-elevations on v1-v6

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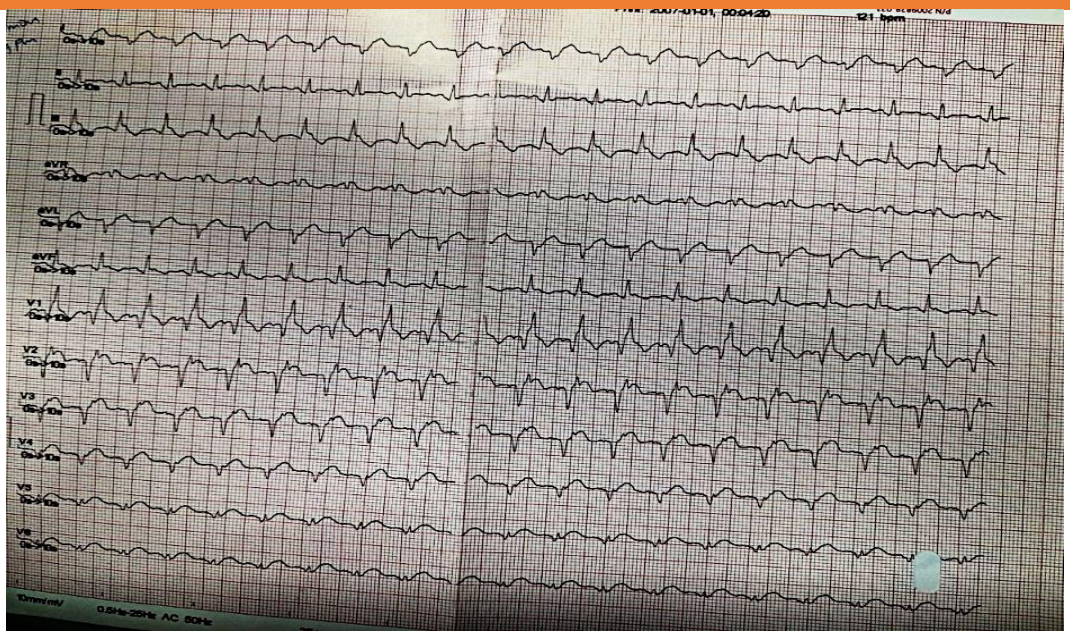

Fig 2: The patient's ECG shows ventricular tachycardia.

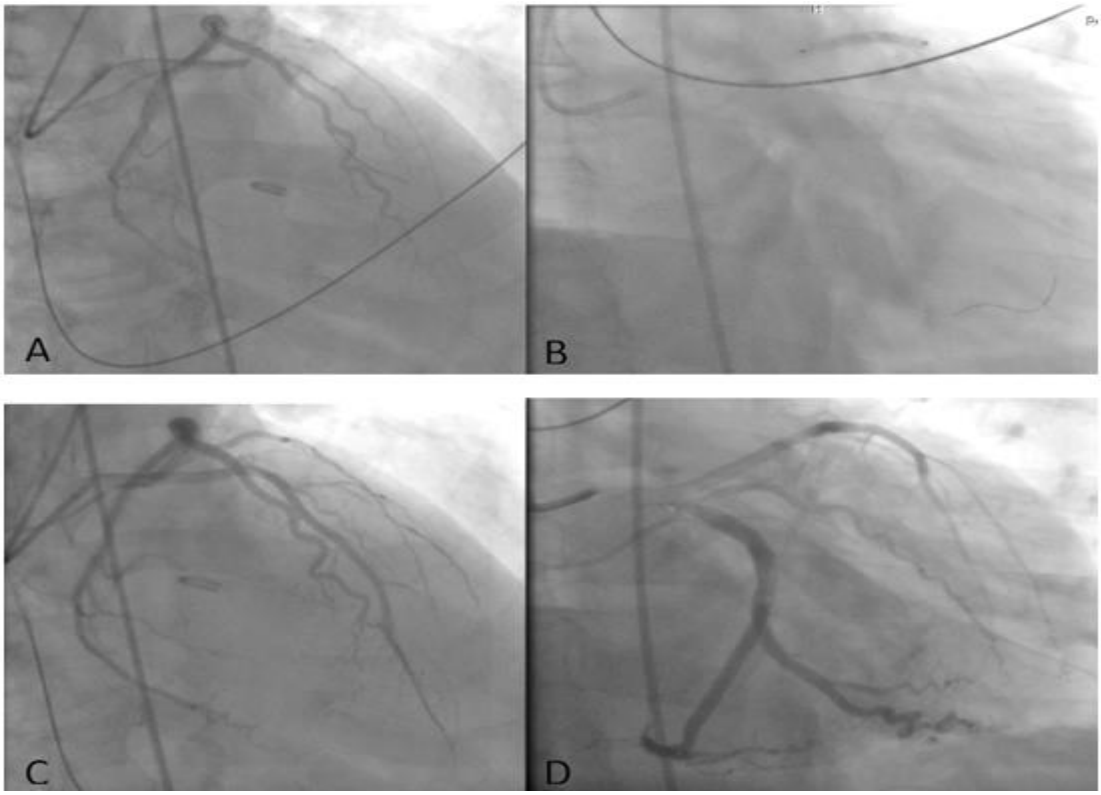

Fig 3: Left coronary angiogram: (A) Anterior-posterior (AP) cranial view showing total mid left anterior descending coronary artery occlusion and coronary wire across the lesion. (B) In the right anterior oblique (RAO) caudal view, drug-eluting stent implantation across the occluded segment. (C and D) depicted patent LAD with grade III TIMI Flow in both projection

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3. Discussion

The management of acute ST STEMI complicated by full atrioventricular (AV) block with concomitant recurrent cardiac arrest and hemodynamic instability presents a significant clinical complex. The degree of instability that required numerous resuscitations and a prolonged period on temporary pacing support highlights the severity and complexity of the case, even though the development of high-grade AV block and anterior STEMI is a known event. When a patient develops AV block in STEMI, it leads to a poor prognosis because of substantial conduction and myocardial involvement; it is more common in inferior infarctions but less common in extensive anterior infarctions. [5]

Although the patient required transvenous temporary pacing (TVP) and had received only transcutaneous pacing (TCP), current ACLS and guidelines recommend a rapid transition from TCP to TVP in cases of persistent symptomatic bradycardia, as transcutaneous pacing often fails to achieve consistent capture and is associated with pain and inadequate cardiac output. (6) Recurrent arrests suggest that resource-limited TVP equipment has contributed to persistent hemodynamic instability and disease severity.

STEMI with AV block, particularly anterior infarctions, is associated with increased morbidity and death. This case is compelling because, whereas prior research supports pacing and shows the overall occurrence of AV block in STEMI, few studies report recurrent cardiac arrests despite pacing attempts. Transient block or isolated hemodynamic compromise was treated with pacing, which accounted for the majority of cases. [7]

In a resource-limited area, TVP is underutilized. The literature shows that early pacing is associated with improved outcomes in patients with shock and conduction block. The majority of known cases improved with a single stabilization attempt, in contrast to our case, which included five distinct times of cardiac arrest, hemodynamic collapse, and progression from TCP to TVP, which was delayed because of limited resources. [8]

In many studies, increased morbidity and mortality are associated with conduction block complicating acute myocardial infarction. Acute ST-segment elevation myocardial infarction frequently leads to complete atrioventricular (AV) block. Patients with STEMI have a higher risk of developing a complete AV block than patients without STEMI. [5] To maintain cardiac output and stop the development of harmful arrhythmias, temporary pacemakers (TP) are used in patients with atrioventricular block and ST-segment elevation myocardial infarction (STEMI). [6]

Therefore, TCP is a useful therapeutic option for patients with cardiac dysrhythmia emergencies, providing temporary support for adequate cardiac output and tissue perfusion. To stabilize patients and enhance their outcomes, TCP can be started as early as possible. [7]

When emergency patients experience hemodynamically significant bradycardia, external cardiac pacing can be life-saving. Patients who respond to external pacing show a significant increase in blood pressure after its use. [9]

The case effectively demonstrates the successful implementation of transcutaneous pacing as a bridge to definitive PCI treatment, including specific technical details on pacing parameters; however, it lacks detailed information on the patient's pre-existing cardiac risk factors beyond hypertension, which would have provided additional context for understanding the development and progression of the condition.

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3. Conclusion

This case report highlights the importance of detecting and treating third-degree AV block in STEMI patients as early as possible, and the use of transcutaneous pacing in an emergency setting for symptomatic third-degree AV block following a STEMI complication.

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Competing interests

The authors declare no conflicts of interest.

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