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Case Report

# Optimal treatment resolves total atrioventricular block in patient with myocardial infarction non-obstructive coronary artery: A case report

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ABSTRACT

*Background:* Total atrioventricular block (TAVB) cause of myocardial infarction non-obstructive coronary artery (MINOCA) in the anteroseptal segment is an uncommon case. Appropriate treatment can prevent worsening and give the best outcome to the patient.
*Case Presentation:* We present a TAVB patient with unstable hemodynamics and complains of severe chest pain. Narrowing in the LAD segment was found in the coronary angiography without any sign of atherosclerosis. The patient improved with optimal reperfusion, and TAVB resolved within 24 hours.
*Conclusion:* Optimal treatment focused on rapid reperfusion due to vasospasm can resolve TAVB and improve clinical conditions in the patients.

## 1. Introduction

Patients diagnosed with total atrioventricular block (TAVB) usually present with dyspnea and chest pain, followed with unstable hemodynamics.[1] TAVB in myocardial infarction non-obstructive coronary artery (MINOCA) patients is rare, especially in the anteroseptal segment infarction. Several underlying mechanisms contribute to MINOCA, including coronary vasospasm, microvascular dysfunction, spontaneous coronary artery dissection, and spontaneous thrombosis resolution. In MINOCA patients with provocative tests, 46% show coronary vasospasm as the usual cause, which highlights the critical role of vasospasm in the pathophysiology of MINOCA, leading to TAVB.[2,3]

TAVB in MINOCA poses diagnostic and therapeutic challenges. Managing myocardial infarction (MI) with classical obstructive coronary artery disease (CAD) is easier with taking revascularization procedures like PCI or thrombolysis.[4] In contrast, managing MINOCA is more challenging, especially in treating TAVB due to the involved pathophysiology. Early recognition and intervention are crucial for positive outcomes in MINOCA patients TAVB. Rapid reperfusion strategies can restore coronary perfusion and resolve conduction disturbances through vasodilation.[4] This case report underscores the significance of early diagnosis and optimal treatment focused on rapid reperfusion due to vasospasm can resolve TAVB and improve clinical conditions in the patients.

## 2. Case Presentation

In the emergency room, 65 years old came with unstable hemodynamics. The vital signs were blood pressure 70/48 mmHg, heart rate 49 times palpation, and respiratory rate 32 times per minute. An electrocardiogram demonstrated TAVB with ventricular escape rhythm (figure 1). Troponin test was positive, and other laboratory tests were normal. There were no diabetes mellitus, dyslipidemia, hypertension, or smoking. A temporary pacemaker (TPM) is placed in ICCU for the patient. Patient was started on intravenous nitroglycerin preparation for coronary angiography and there was improvement in chest pain.

Coronary angiography revealed narrowing blood vessels in the left artery descending (LAD) segment (figure 2A). There is no specific sign of atherosclerosis, and no thrombus was found. Intracoronary isosorbide dinitrate 1 mg was performed, dilatation of the previously narrowing mid-LAD was shown, and chest pain gradually disappeared (figure 2B). Another Right Coronary Artery (RCA) and Left Circumflex Artery (LCx) vascular segment evaluation is shown in normal conditions (Figure 2C & 2D). The patient decided not to proceed with stenting and was referred again to ICCU for monitoring.

Norepinephrine was administrated 0.1 mcg/kgBW/minute and after 3 hours of ICCU monitoring, the patient blood pressure was 120/80 mmHg, and the norepinephrine was stopped. Oral diltiazem 30 mg twice daily and intravenous nitroglycerin were also continued. Electrocardiography reveals sinus rhythm with a resolution of TAVB within 24 hours and a heart rate was 70 beats per minute. A temporary pacemaker was standby. Double antiplatelet acetylsalicylic acid, clopidogrel, atorvastatin 40 mg, fondaparinux injection 2.5 mg persisted until 5 days.

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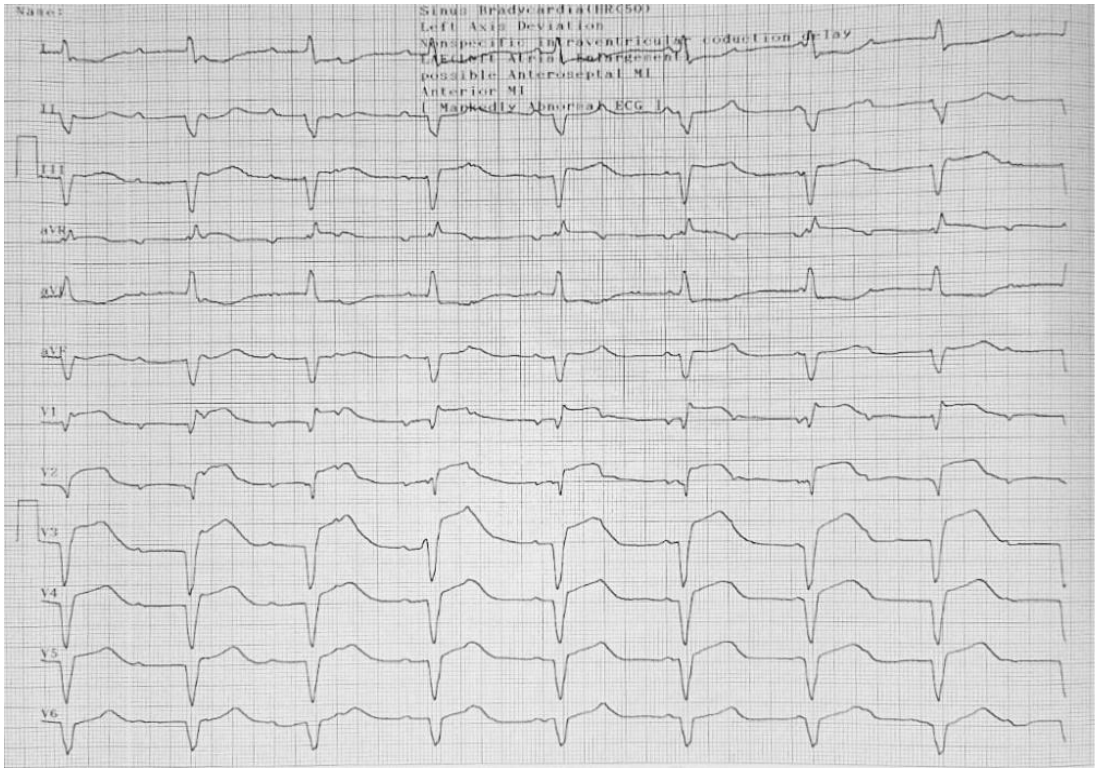


**Figure 1.** ECG with ST-elevation anterior segment with TAVB.

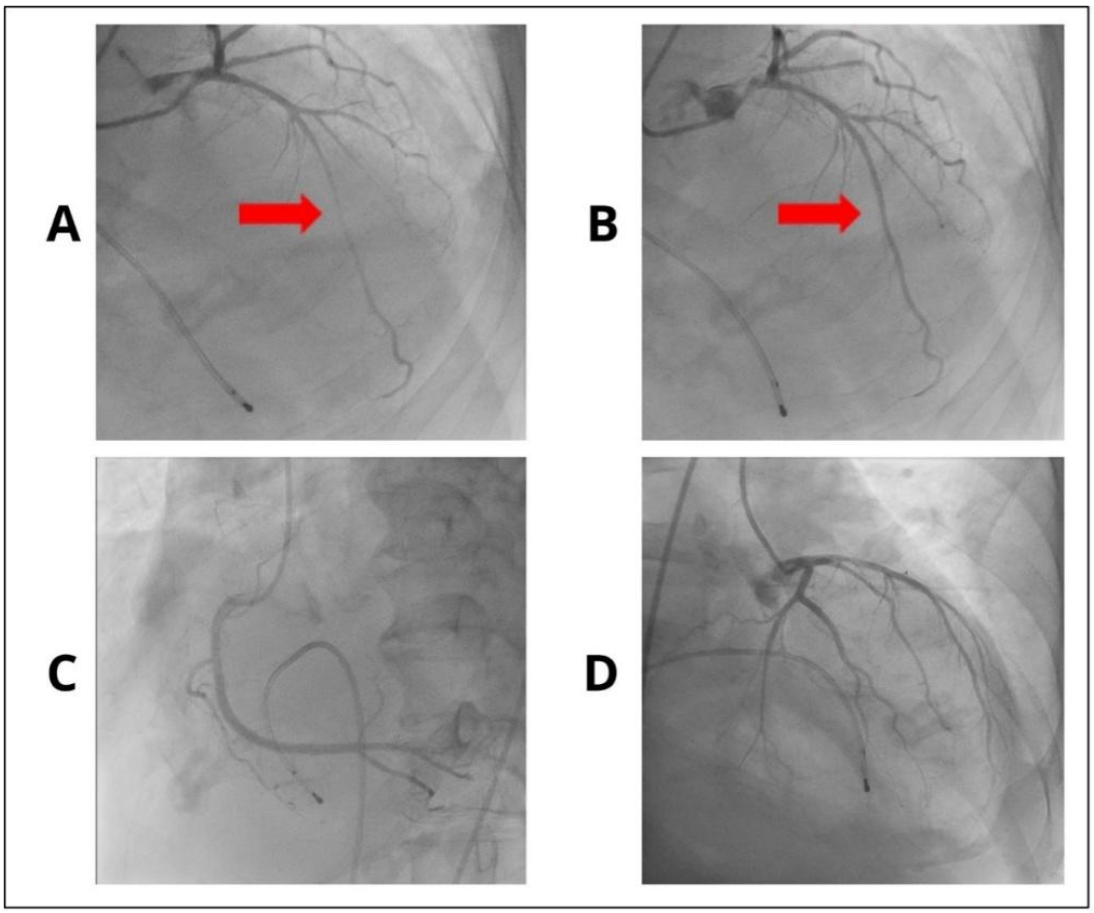


**Figure 2** (A). Significant epicardial spasm in the middle segment of the LAD before intracoronary nitrate administration. (B) Epicardial spasm regressed and dilatation of the previously narrowing middle segment of the LAD after 1 mg intracoronary of isosorbide dinitrate. (C, D) The right coronary artery (RCA) and left circumflex artery (LCx) were within normal limits.

## 3.Discussion

ST-segment elevation condition in MINOCA predicts causes of death, and there is an increased mortality observed in ST-elevation myocardial infarction (STEMI) compared with non-ST-elevation myocardial infarction (NSTEMI).[5,6] However, patients with MINOCA typically present with angina-like symptoms and have elevated cardiac troponin, similar to patients with myocardial infarction due to obstructive coronary artery disease.[4] MINOCA should be considered a diagnosis when there is no clear evidence of cause for increased troponin level in the patient.[7] If the data supports an acute myocardial infarction but the angiography results do not show stenosis, a provocative test needs to be carried out. In this case, the vasospasm was visible on angiography, so there was no need to do a provocative test, nitrate was immediately given to the patient.

TAVB can occur due to vascular or non-vascular problems such as degenerative processes caused by age, smoking habit, and risk of diabetes or hypertension in the long term. However, in this patient, risk factors such as diabetes, hypertension, and smoking habits were denied.[8] Additionally, genetic predispositions such as ACE I/D and bradykinin B2 receptor polymorphisms are known to influence individual responses to cardiovascular medications like ACE inhibitors, which may also contribute to variability in cardiovascular outcomes.[9] This inter-individual variability is echoed in other fields, such as studies identifying predictors of high antibody titers in convalescent plasma donors for SARS-CoV-2, where host factors significantly affect therapeutic responses.[10] Furthermore, TAVB only happens when the MINOCA is established and improves after rapid treatment for coronary spasm with vasodilators given to the patient. Clearly, the TAVB was caused by MINOCA, and it improved after the underlying MINOCA was resolved. Interestingly, absence of hypertension in this patient might also reflect the absence of AGT gene polymorphisms, such as M235T or T174M, which have been associated with the development of essential hypertension in various populations.[11] Several previous studies have reported that patients who experienced TAVB were more likely associated with inferior myocardial infarction (STEMI inferior)[12-14]. It occurs cause of disruption of blood supply to an atrioventricular node or the upper portion of the bundle. The occlusion to these arteries is responsible for 90% of inferior myocardial infarction and could lead to AV block condition. This was not like what happened with our patient, who experienced TAVB due to complications from anteroseptal ST-elevation MINOCA, where there was a blockage in the mid-distal LAD artery. This TAVB condition occurred because there was a myocardial infarction involving the septum. The heart's septum acts as a protector and separates the heart into right and left parts. Generally, when there is a disturbance of the anterior segment of the heart, it can't affect the atrioventricular node, which is supplied from RCA because of the protection from this septum. So, when there is extensive myocardial infarction involving the septum, it may result in extensive bilateral bundle branch infarction and lead to TAVB.[15] The complexity of MINOCA and its complications, such as TAVB, underscores the need for multifactorial assessment and individualized management strategies. Similar to how multifaceted determinants influenced the decline of notified dengue infections in Indonesia in 2017, recognizing and addressing a range of clinical and environmental factors is essential for improving outcomes in rare cardiovascular presentations.[16]

## 4. Conclusion

This case report demonstrates that anteroseptal segment infarction due to the vasospasm of the LAD artery in a MINOCA patient can cause TAVB. Optimal intervention in the underlying coronary vasospasm can resolve TAVB and improve the patient's clinical conditions.

## 5. Declaration

*5.1 Ethics Approval and Consent to participate*
Patient has provided written informed consent prior to involvement in the study.

*5.2. Consent for publication*
Not applicable.

*5.3 Availibility of data and materials*
Data used in our study were presented in the main text.

*5.4 Competing interests*
Not applicable.

*5.5 Funding Source*
Not applicable.

*5.6 Authors contributions*
Idea/concept: SS. Design: ADS. Control/supervision: SS. Data collection/processing: MRFH. Analysis/interpretation: MIA. Literature review: MRFH, MIA. Writing the article: MRFH, AIT. Critical review: SS, MRFH, MIA, ADS, HFR. All authors have critically reviewed and approved the final draft and are possible for the content and similarity index of the manuscript.

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