

Case Report

# Inadvertent malposition of temporary pacemaker lead in the left ventricle in a patient with acute myocardial infarction

Zheng-Wei Chen <sup>1,2</sup>, Pang-Shuo Huang <sup>1,2</sup>, Po-Chi Lin <sup>2,\*</sup>

<sup>1</sup> Division of Cardiology, Department of Internal Medicine, National Taiwan University College of Medicine and Hospital, Yun-Lin Branch, Dou-Liu, Taiwan

<sup>2</sup> Division of Cardiology, Department of Internal Medicine, National Taiwan University College of Medicine and Hospital, Taipei, Taiwan

\* Po-Chi Lin, MD, Department of Internal Medicine, National Taiwan University Hospital, No. 7, Chung-Shan South Road, Taipei, 100, Taiwan, Tel: + 886-2-23123456 ext.62152, E-mail: juipeter@gmail.com

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## Abstract:

Temporary pacemakers (TPM) are utilized in emergency situations when severe bradyarrhythmias secondary to acute myocardial infarction (AMI) and to non-AMI related cardiac disorders. Malposition of pacemaker lead is rare complication during pacemaker implantation. Here we reported a unique case found inadvertent malposition of temporary pacemaker lead passing through patent foramen ovale (PFO) into the left ventricle (LV) during emergent percutaneous coronary intervention for ST-elevation myocardial injury (STEMI).

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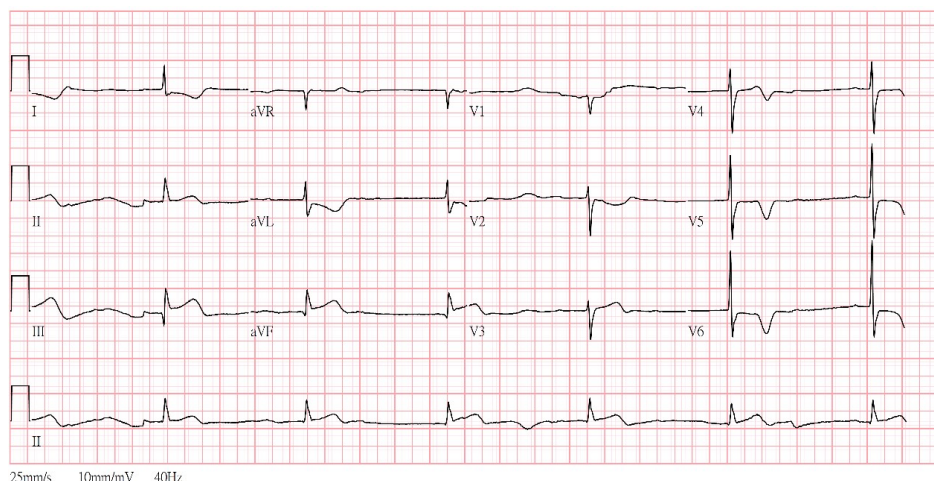
**Keywords:** Malposition; Temporary pacemaker; Patent foramen ovale; Percutaneous coronary intervention

## 1. Introduction

Malposition of pacemaker lead is a rare complication of pacemaker implantation[1]. The most common reported location of malposition is LV cavity due to existed PFO. It is associated with increased thromboembolic risks if left untreated [2]. However, early recognition required careful reading of 12-Leads surface electrocardiogram (ECG) pacing morphology and other imaging modalities including chest X-ray and fluoroscopic images. In this case, TPM was indicated due to severe bradycardia developed in acute myocardial infarction (AMI). The malposition of TPM lead was suspected due to unusual pacing QRS morphology and confirmed by echocardiography after transferal to cardiac intensive care unit.

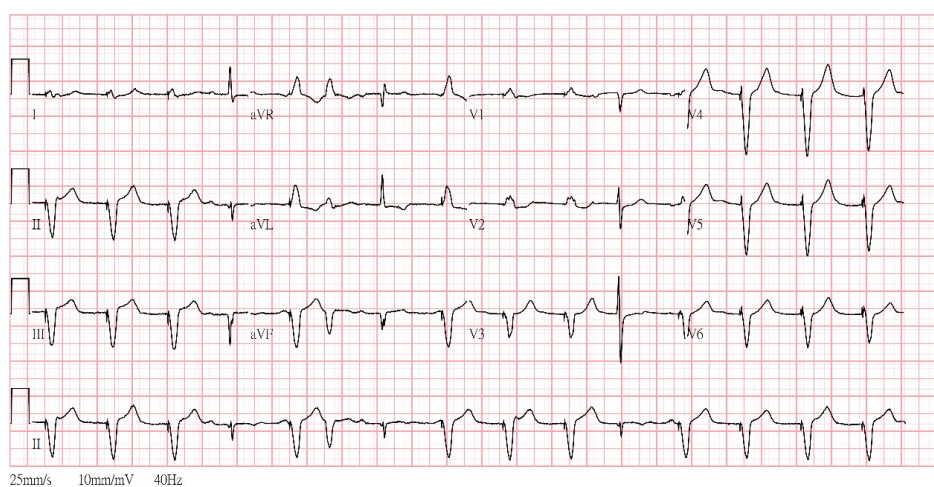
## 2. Case Presentation

A 71-year-old man presented to the emergency department with chest pain, diaphoresis, nausea and vomiting for 2 hours. He was a heavy smoker with medical history of hypertension. The ECG (Fig. 1) showed complete atrioventricular block with junctional escape rhythm and ST-segment elevation in leads II, III and aVF. Under the diagnosis of inferior ST-elevation myocardial injury (STEMI), emergent cardiac catheterization was initiated. Coronary angiography revealed proximal right coronary artery (RCA) total occlusion. Percutaneous transluminal coronary angioplasty and stenting to RCA was performed after temporary pacemaker implantation. The follow-up ECG (Fig.



**Figure 1.** 12-Leads surface ECG shows complete atrioventricular block with junctional escape rhythm and ST-segment elevation in leads II, III and aVF.

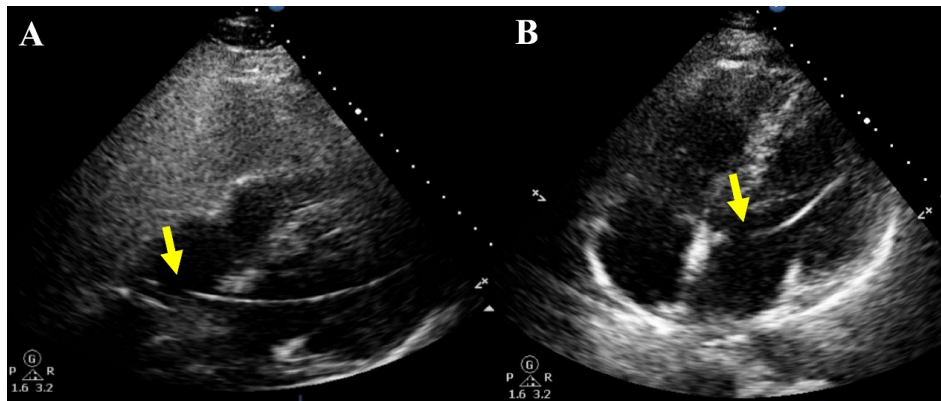
2) showed the pacing QRS morphology was right bundle branch block (RBBB)-like pattern in lead V1-V2, and an inappropriate lead position was suspected. Echocardiography was done to check the position of TPM lead. In the subcostal and modified four-chamber view (Fig. 3), the TPM lead entered from right atrium through patent foramen ovale (PFO) to left atrium then into LV. We then carefully removed temporary pacemaker under echocardiographic guidance without complication. He was discharged with outpatient clinics follow-up afterwards.



**Figure 2.** 12-Leads surface ECG shows the pacing beats was RBBB-like pattern in lead V1-V2.

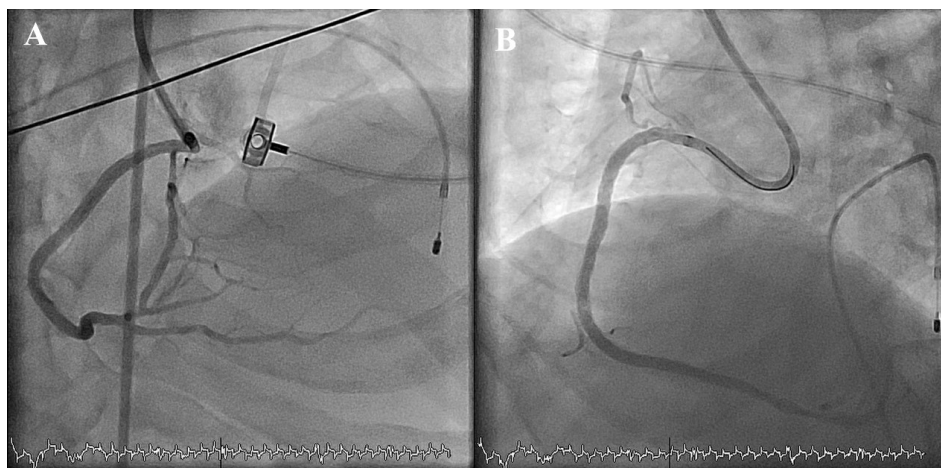
### 3. Discussion

In this case, the TPM lead was unintentionally malpositioned through PFO into the LV during emergent coronary intervention. In the meanwhile, the physician concentrated on the cardiac catheterization but not paid attention to the location of pacemaker lead on the fluoroscopic images during the procedure. Fortunately, we recognized that the pacing rhythm on surface ECG was not typical LBBB morphology, which raised the suspicion of inappropriate TPM lead position. Further echocardiography confirmed the course of TPM lead. The indication for temporary pacing in acute myocardial infarction includes medically refractory symptomatic or hemodynamically significant bradyarrhythmias associated with sinus node dysfunction or atrioventricular block [3]. Generally, the tip of temporary pacemaker lead was located at the apex of right ventricle (RV) to secure adequate



**Figure 3.** Two-Dimensional transthoracic echocardiography images showed the temporary pacemaker lead passed through interatrial septum and located on lateral wall of LV. (A) Subcostal and (B) modified four-chamber view. Yellow arrow indicated the TPM lead.

back-up pacing. Rarely, the transvenous pacemaker lead could be malpositioned in coronary sinus [4,5], cardiac veins [6–8] and left ventricle [9–14], and most of cases were described during permanent pacemaker implantation. According to one recent study, the incidence of inadvertent lead malposition was estimated at 0.34%, with scoliosis, congenital heart disease (CHD), prior surgery for CHD and inexperienced operator reported as major risk factors [1].



**Figure 4.** Fluoroscopic image after stenting to RCA. It clearly showed the TPM lead was malpositioned posteriorly into LV. (A) Anteroposterior, 30° cranial view and (B) 60° left anterior oblique view

The pacemaker lead could pass through interatrial or interventricular septum to LV unintentionally if atrium septal defect (ASD)/PFO [15–17] or ventricular septal defect (VSD) [18] presented or after perforating the fossa ovalis or interventricular septum [19–21]. Sometimes, it could also occur due to inadvertent transarterial puncture, and the lead further crossed the aortic valve then into LV [22–24]. The detection of lead malposition required alertness when reading 12-Leads surface ECG, especially precordial leads. The pacing morphology of lead V1 should be LBBB pattern if the lead was adequately inserted at RV [25]. Besides, chest X-ray could also give clues if the tip of the lead was not located anteriorly on lateral projection [12,26]. In our case, fluoroscopic image, particularly left anterior oblique (LAO) view, when performing cardiac catheterization was another important hint of LV pacing [27]. To look back the final fluoroscopic angiography, it showed the TPM lead was implanted posteriorly into LV but not RV (Fig. 4). Under suspicion, further echocardiograms and computed tomography (CT) scans could be done to confirm the actual position of the lead [14,28].

In previous literatures, several complications had been reported if left LV lead untreated, such as thromboembolic events [2,9,29], perforation of the mitral valve leaflets [13], and even ventricular

perforation [10,30]. Therefore, early diagnosis of lead malposition and removal were important to prevent these events. In permanent pacemaker with lead placed for long time, lifelong anticoagulant with warfarin might be therapeutics of choice [31]. Lead extraction should be reserved if failed anticoagulation therapy or concomitant other cardiac surgery [32–34].

The present case was intended to alert physicians about this rare complication and highlight the importance of prevention and early detection of complication, especially under fluoroscopy guidance during cardiac catheterization.

## 4. Conclusion

Inadvertent pacemaker lead malposition in LV is a rare but potentially serious complication during pacemaker implantation. It required high degree of alertness when reading surface ECG and fluoroscopy image. Early removal of malpositioned lead should be done to avoid possible thromboembolic episodes.

### Conflicts of Interest:

The authors declare no conflict of interest.

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