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Rapid spontaneous coronary artery reperfusion following severe bradycardia during exercise tolerance test: A rare case report

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ABSTRACT

The acute occlusion of a coronary artery without the evidence of myocardial infarction might immediately affect both the diagnosis and treatment of coronary artery disease. We present the case with a sudden occlusion of the left main coronary artery without typical chest pain following an exercise tolerance test and rapid spontaneous reperfusion of the left main coronary artery.

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Introduction:

Coronary artery disease (CAD) accounts for a high percentage of cardiovascular disease (CVD); therefore, early diagnosis and treatment will lead to less morbidity and mortality (1).

The sudden-onset acute occlusion of a coronary artery without the evidence of myocardial infarction might influence practitioners to delay both the diagnosis and treatment of CAD (2). In this study, we present the case of an old man who had the occlusion of the left main coronary artery without typical chest pain that presented with abrupt bradycardia following a treadmill test and rapid reperfusion of coronary arteries.

Case presentation:

A 60-year-old man weighing 70 kg admitted to the heart division of the emergency department with a complaint of occasional atypical chest pain and shortness of breath. He was in functional class II, NYHA classification. He did not have any history of hospitalization and drug use. There was also no mentioned family medical history of cardiac disease. He reported worsening of the symptoms in the last two days before admission. On admission, the patient was in a stable condition. The case had a blood pressure of 132/89 mm Hg, and the heart rate was regular reported as 94 beats per min. The respiratory rate was 22 breaths per minute, and he was a febrile.

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Oxygen saturation with a finger pulse oximeter in the index finger measured as 96% at rest. In a physical examination, very slight crackles auscultated in the bilateral base of the lungs. Cardiac auscultation revealed a soft grade 2/6 diastolic murmur at both right and left sternal borders and mitral zone. The chest X-ray in the posteroanterior view showed the cardiothoracic ratio in the normal range. Besides, the aortic arch was normal, and the main pulmonary artery was flat. The right descending pulmonary artery was normal. He had a history of smoking for 35 years and no other risk factor related to CVD. The electrocardiogram (ECG) showed normal findings without pathologic features (Figure 1).

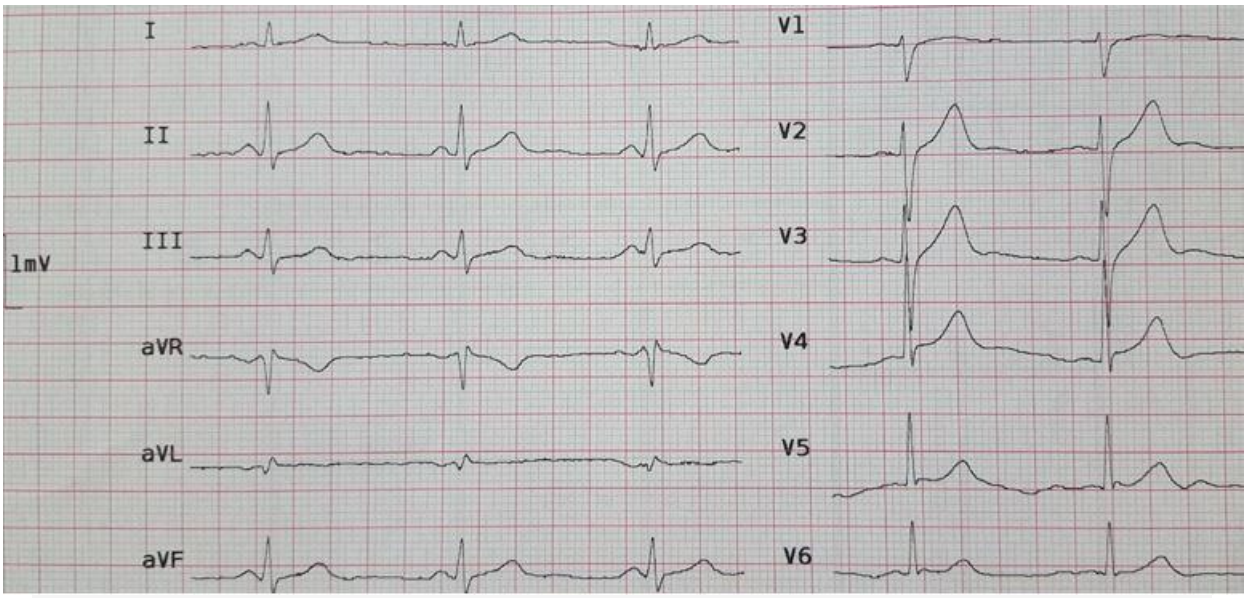

Figure 1. Illustration of normal voltage, speed, and normal axis deviation by 12-lead electrocardiogram; origination of P-wave from the sinoatrial node (normal sinus rhythm); normal PR interval; no significant ST-segment and T-wave changes with norma

The patient referred to the echocardiographic study unit in the heart center. Transthoracic echocardiography showed no dramatically abnormal findings summarized in Figure 2. Due to his inappropriate lifestyle and no other evidence for the diagnosis of disease, the case was a candidate for an exercise tolerance test (ETT). After the initiation of the ETT, although the patient was in the exertional period after 2 min and 59 seconds, he experienced bradycardia with a heart rate of 57 beats per minute (Figure 3-A). Suddenly, severe bradycardia was obvious (heart rate: 48 bpm), and the evidence of inferior myocardial infarction observed in the ECG (Figure 3-B).

The physician stopped the ETT, and the patient was in a complete bed-rest situation with continuous cardiac monitoring. Immediately, emergency services called to refer the patient for critical care and percutaneous intervention. During this time, bradycardia disappeared (heart rate: 88 bpm) (Figure 3-C). After 1:20 sec of stopping the ETT, the cardiac monitoring showed the evidence of the reperfusion of coronary arteries with the T-wave inversion in inferior leads (Figure 3-D).

Afterward, the patient referred for emergency coronary angiography. In angiography, he had an occlusion of the left anterior descending (LAD) artery (Figure 4-1) and evidence of the posterior descending artery (PDA) occlusion (Figure 4-2), leading to being a candidate for coronary artery bypass graft. In the operation room, after general anesthesia, a median sternotomy was performed in the supine position. The surgeon harvested the saphenous vein with 5-6 mm diameters and left internal mammary artery (LIMA) with 1.5 mm diameters. He anastomosed the saphenous vein to diagonal, PDA, and obtuse margins.

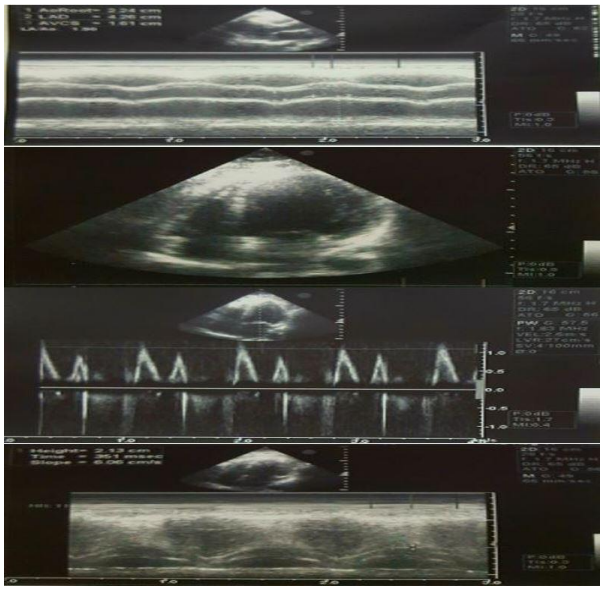

Figure 2. Presentation of normal left ventricular size with normal ejection fraction: 55% by echocardiography; normal size and function of the right ventricle; tricuspid annular plane systolic excursion: 1.85; observation of no valvular heart disease

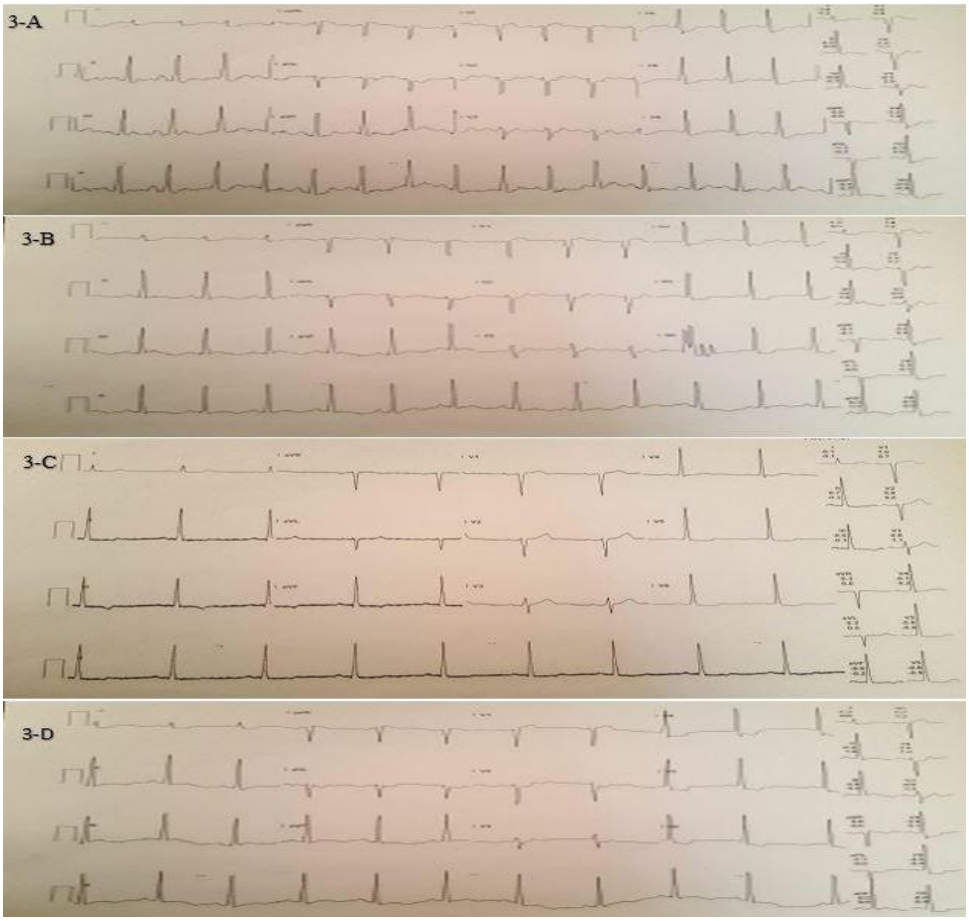

Figure 3. A) patient in exercise tolerance test with bradycardia in 2:59 min; B) severe bradycardia (heart rate: 48 bpm) and evidence of ischemia in inferior leads; C) patient in complete bed rest and an indication of inferior leads by ischemic D) Appearance of T wave inversion and reperfusion of affected coronary arteries.

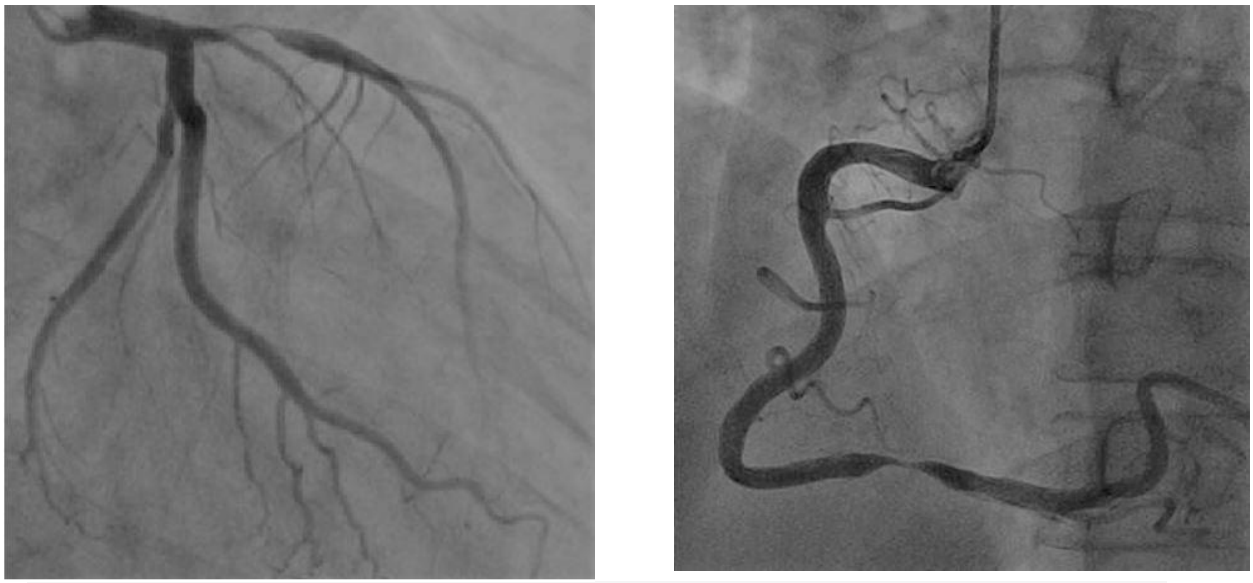

Figure 4: A) Illustration of the proximal left anterior descending lesion with thrombus by coronary angiogram B) of posterior descending artery occlusion by coronary angiogram in the left anterior oblique view.

Subsequently, three grafts anastomosed to ascending the aorta. Also, the LIMA anastomosed to the LAD artery. The chest was closed, and the patient was transferred to the postanesthesia care unit and then to the open heart intensive care unit (ICU).

The patient discharged after three days of hospital stay and critical care in the ICU with a favorable general condition and prescribed medications. Before the patient left the hospital, he was introduced to the cardiac rehabilitation department and consulted if there was a probability incidence of CAD referral to the emergency department, and to avoid dangerous events closely monitored.

Discussion:

The exercise as physiological stress is known that helps an individual to illustrate the probable presence or absence of CAD, which may be vague at rest. An ETT is one of the numerous noninvasive clinical methods used for this purpose (3). The most critical feature in the present studied patient was rapid coronary artery reperfusion after the incidence of low-perfusion cardiac muscle signs in continuous ECG trace during the ETT. This case was not previously reported and seemed to be a rare case.

The case referred for an ETT to exclude the probability of CAD. In this regard, the accuracy of an ETT in the diagnosis of CAD is dependent on some risk factors and clinical presentation of the patient; therefore, an ETT seems more authentic in excluding this disease rather than confirming it (4). The typical response of the sinus node in the exercise situation is a gradual increase in the heart rate. Even in patients with sinus chronotropic dysfunction, although the achieved maximal sinus rate is less than that reported for the healthy subject, the heart rate usually increases (5). In the present case, even though the ETT initiated, not only the heart rate was not increased, but also it was lower than expected heart rate, and the patient experienced bradycardia.

One of the most common reasons for the paradoxical reflex to decrease heart rate followed by exercise is a hypoxic situation in the sinoatrial (SA) node. A defect of the blood supply to the SA node may clarify the sinus deceleration by a direct effect of ischemia. The SA node artery is responsible for perfusing the SA node and mainly originates as a branch of the right coronary artery (RCA); however, in some individuals, it has arisen from the circumflex artery, which is a branch of the left coronary artery (LCA) (5-7). In this case, after referring the patient for coronary angiography, there was an occlusion in the

proximal segment of the LAD artery and RCA branches. The involvement of the two main branches of coronary arteries without characteristic features was the rarity of this case not reported in other cases.

In this patient, no evidence was observed related to CAD before the ETT in the ECG. Some of the subjects may have no evidence of ECG abnormality before the exercise. In many of them, this presentation may be due to the occlusion of the LCA (8). This case may be considered the involvement of the indirect effect of ischemia evoked by Bezold-Jarisch reflex. This phenomenon is an inhibitory reflex induced by the stimulation of mechanoreceptors in the heart and promotes parasympathetic activity, leading to bradycardia, vasodilation, and hypotension (8-9). Nevertheless, in this patient, no chemical or mechanical stressor induced bradyarrhythmia and unstable hemodynamic condition.

This case reported with the RCA dominance in the cardiac angiogram. It is a benefit for this patient because some studies have shown that the presence of the RCA dominance may alter the clinical outcomes of patients, and this feature may increase the risk of mortality due to acute coronary syndrome (10). In these patients, the left circumflex coronary artery perfuses the lateral and inferior walls of the heart; therefore, its occlusion may damage a significant area of the heart (11). In the present case, with the RCA dominance, the RCA was occulted; however, collateral perfusion in rest situations may prevent damage to the right side of the heart that, with exertional effort presents an imbalance between the supply and demand in cardiac muscle. This feature may be the reason for no sensation of chest discomfort and another new clinical presentation.

Conclusion:

In the ETT should be considered the potential complications of this diagnostic method in all patients. Also, the clinicians should be obligated to closely monitor subjects during an ETT for the prevention of unwanted complications, such as paradoxical bradycardia, observed in this case.

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Conflicts of Interest:

The authors declare that there is no conflict of interest.

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