

Right ventricular myocardial infarction due to low-voltage electric shock: a case report

Nalan Kozaci^{1,✉}, İhsan Danış¹, Ali Kemal Erenler¹, Tayfun Anıl Demir², Mustafa Avci³

1. Department of Emergency Medicine, Alanya Education and Research Hospital, Alanya Alaaddin Keykubat University, Faculty of Medicine, Antalya, Turkey; 2. Department of Emergency Medicine, Gazipaşa State Hospital, Antalya, Turkey; 3. Department of Emergency Medicine, University of Health Sciences, Antalya, Turkey

✉ Correspondence to: nalankozaci@gmail.com

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Severe injuries due to electricity are rare, but when they occur, they may cause life-threatening conditions. In order to define the severity of electrical injuries, the most widely used classification is voltage power. Injuries are mainly classified into two categories as low voltage electrical injuries (LVEI) (< 1000 V) and high voltage electrical injuries (> 1000 V). Fatal injuries have been reported mostly after high-voltage electric shock. Low-voltage electricity current rarely causes severe trauma and complications.^[1,2]

Electricity injuries present with a wide range of clinical manifestations from skin burns to fatal cardiac dysrhythmias. It is well-documented that severe cardiac manifestations occur just after injury. Patients with electric shock may present cardiac manifestations, such as hypertension, dysrhythmia, acute myocardial infarction (MI), and cardiac rupture. It has been reported that when patients with MI following electric shock have undergone angiography, no abnormalities have been detected in the coronary vessels. The presence of MI has been linked to vasospasm of the coronary arteries.^[3,4] In this report, we present a case with ST-segment elevation MI following LVEI.

A 73-year-old female patient admitted to a state hospital emergency department due to chest pain developed just after an electric shock. An inferior MI was determined; acetylsalicylic acid, clopidogrel, and heparin were given, and the patient was transferred to our hospital for coronary angiography. The patient was evaluated in the emergency department of our hospital, and she was in good general condition, conscious, and cooperative. The patient's history revealed that she had been exposed to an electric shock in her right hand due to an electrical leak in the blender while cooking at home. She felt chest pain following an electric sh-

ock. Hypertension was determined in her medical history. The physical examination was normal. Her vital signs were as follows: blood pressure of 130/70 mmHg, pulse rate of 78 beats/min, body temperature of 36 °C, and respiratory rate of 16 breaths/min. An electrocardiogram (ECG) was performed; it showed ST-segment elevation in II, III, aVF leads, and ST-segment depression in I, aVL, V1, and V2 leads (Figure 1). Since ST-segment elevation in III lead was greater than in II lead, a right-sided ECG was performed immediately. The right-sided ECG showed ST-segment elevation in leads V4, V5, and V6 (Figure 2). Findings were suggestive of an inferior-posterior and right ventricular MI. A transthoracic echocardiography was performed, and the ejection fraction was determined as 55%. Also, a hypokinesis in the inferolateral wall was determined. Creatine kinase-MB isoenzyme, myoglobin, and cardiac troponin I were normal in the prior hospital analyses. The patient was transferred to the angiography unit. In coronary angiography, a total occlusion in the proximal right coronary artery (RCA) was determined, and a stent was placed. The patient was hospitalized in the coronary intensive care unit for close observation. She was discharged with full recovery after three days.

ST-segment elevation MI occurs rarely following LVEI. Our case was exposed to an electric shock for a short period of time. Any signs of entry or exit related to electric injury on her body were not determined. However, in electrical injuries, in addition to the voltage power, the point of entry and exit of the current is important. If the current passes from hand to leg or hand to hand in the body, the heart is most affected, and this can cause potentially fatal conditions.^[1] Thus, in our case, the electric current has entered through the patient's right hand. In the literature, it is stated

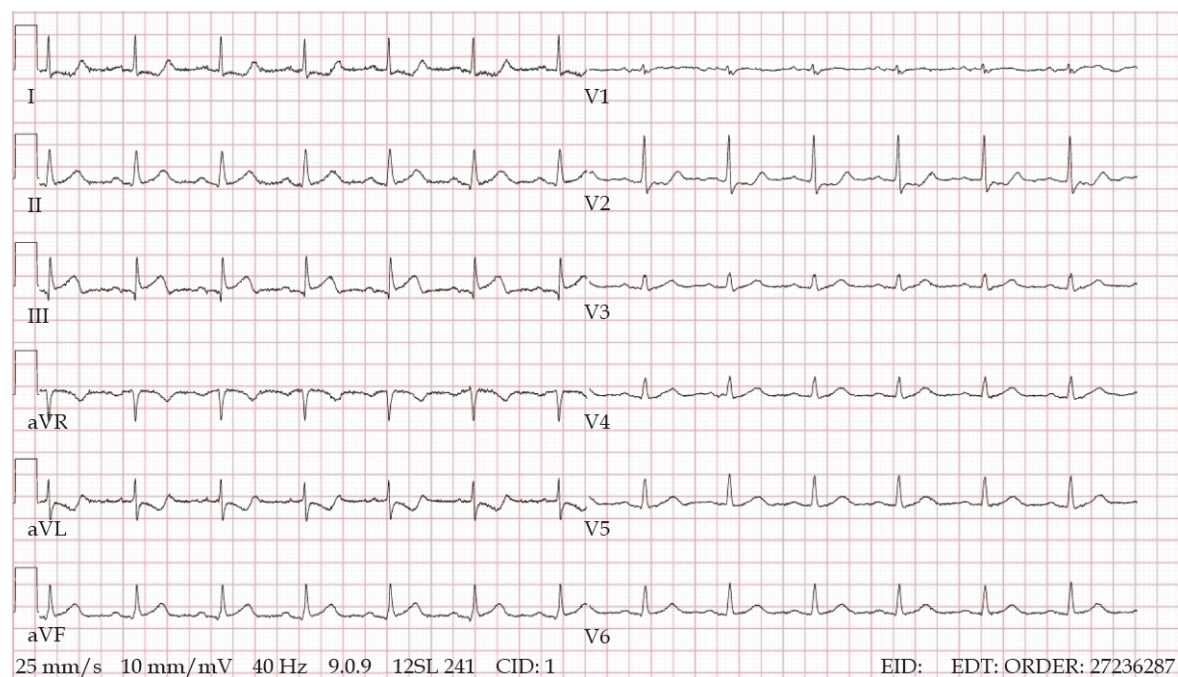


Figure 1 The ECG image. The ECG showed ST-segment elevation in II, III, aVF leads, and ST-segment depression in I, aVL, V1, and V2 leads. ECG: electrocardiogram.

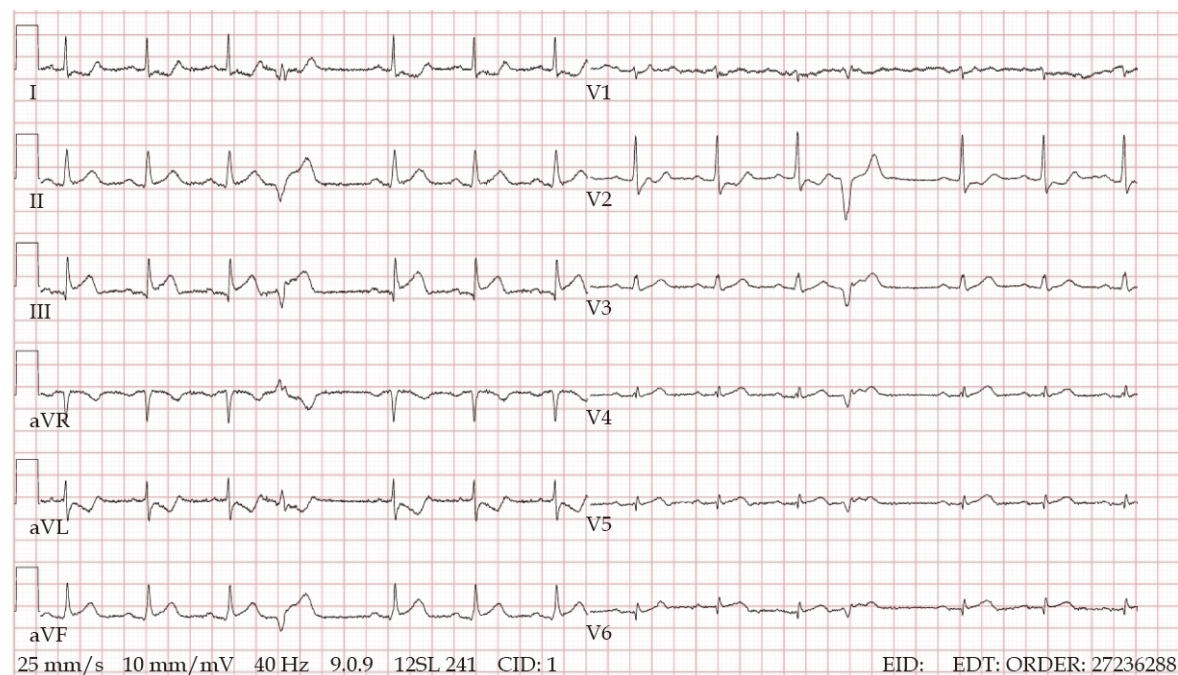


Figure 2 The ECG image. The right-sided ECG showed ST-segment elevation in leads V4, V5, and V6. ECG: electrocardiogram.

that RCA is closer to the chest wall and is more sensitive to electric current. Therefore, ST-segment elevation in inferior leads is more commonly seen following electric injuries.^[3-5] In our case, ECG findings were compatible with the literature. A right inferior-posterior MI was determined. MI fol-

lowing an electric shock is classified into two categories as obstructive and non-obstructive. In most cases, patients who have had a MI after an electric shock have been reported to have normal coronary arteries. Detection of normal coronary arteries suggests a non-obstructive process. This con-



dition has been attributed to coronary arterial vasospasm, direct thermal effects of electricity on the myocardium, hypotension due to dysrhythmia, injury to the coronary artery during cardiopulmonary resuscitation, and hypoxia due to cardiopulmonary arrest.^[3-7] In our case, unlike other cases, a total occlusion of RCA was determined in coronary angiography. Our patient was elderly and in the postmenopausal period. She had a history of hypertension. Therefore, she was in a high-risk group for atherosclerotic disease. It was considered that she already had an atherosclerotic plaque. Acute MI was attributed to thrombus formation as a result of the damage electric current has given to the endothelial layer of the coronary arteries. Blood and vascular tissues, particularly the endothelium, have a very low resistance to electricity due to their high liquid content. Accordingly, electrostatic energy may cause clotting or mediopathy in the vessels without causing any damage to skin or soft tissue. In a study conducted with rabbits, 72 h after electric shock, an increase in fibrin fragments and plasminogen activator inhibitor, and a decrease in tissue plasminogen activator and platelet hyperaggregation were revealed in the blood. These findings support the hypothesis that the clotting process is activated even following LVEI.^[8]

Acute right ventricular MI may develop following LVEI. The entry of the electric current from the right hand, the proximity of the RCA to the chest wall, and the patient's hi-

gh risk of atherosclerotic disease may cause acute RCA occlusion.

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