

Acute Inferior Myocardial Infarction Caused by Lightning Strike

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Abbreviations:

CAG: coronary angiography
ECG: electrocardiography
MI: myocardial infarction

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Abstract

Lightning strike is an infrequent natural phenomenon with serious medical complications, like multiple organ damage, and it is associated with increased risk of mortality. Cardiovascular complications are among the most hazardous complications of lightning strike. Lightning strike can cause various serious consequences ranging from electrocardiographic changes to death. We reported a 21-year-old patient with no cardiovascular risk factors struck by lightning and presented by inferior ST elevated myocardial infarction (MI). The patient was followed up in the intensive care unit and MI complication did not develop during follow-up. The patient was lost due to multi-organ failure after 20 hours.

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Introduction

Lightning strike is an infrequent natural phenomenon with serious medical complications. As the lightning passes through the body, it can cause damage to various organs and systems, and it is associated with high risk of death.¹ Lightning strike complications include cutaneous burns, acute kidney failure, respiratory disorders, neurological disorders, multi-organ failure, and heart disorders like myocardial infarction (MI), arrhythmia, cardiac contusion, and death.² We presented a young patient struck by lightning and developed inferior MI subsequently.

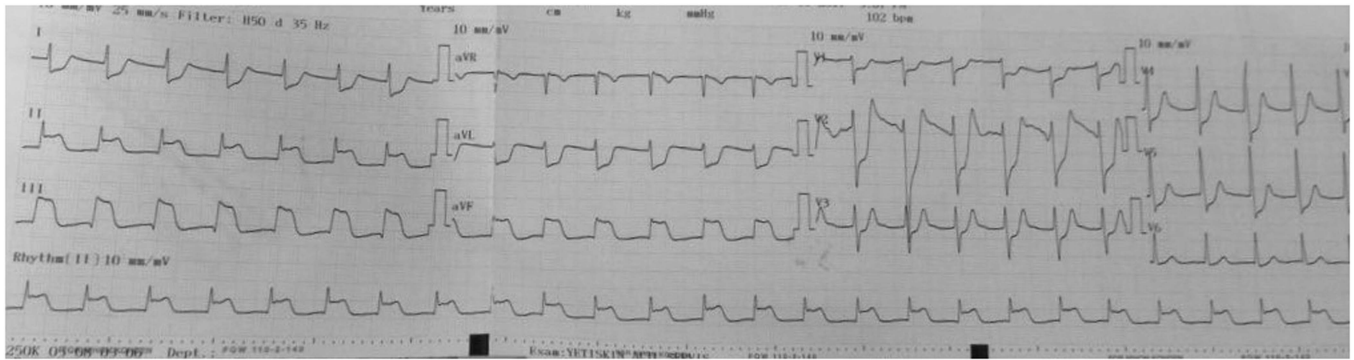
Case Report

A 21-year-old male presented to the emergency department due to lightning strike which had occurred 45 minutes prior. At the admission, Glasgow Coma Score was 14, reactions to verbal stimuli was confused (four points), but eye responses and motor responses were normal (four points and six points, respectively). At the admission, the electrocardiography (ECG) was performed and revealed sinus rhythm at 102 beats/minute with five millimeters ST elevation in D2–D3–AVF derivations and ST segment depression in D1–AVL–V1–V2 derivations, as well as a normal QTc interval was observed (Figure 1). There was ecchymosis on the left shoulder and abdomen areas. Right after his arrival at hospital, he had cardiac arrest. Immediate cardiopulmonary resuscitation commenced by emergency doctors and cardioversion was applied because ventricular tachycardia was detected. The process resulted in spontaneous recovery. After cardiopulmonary resuscitation, Glasgow Coma Score was 11, reactions to verbal stimuli was confused (four points), he opened his eyes to verbal stimuli (three points), and performed normal flexion to painful stimuli (four points).

Laboratory results were consistent with MI and rhabdomyolysis (Creatinine = 1.7 mg/dl; Creatinine phosphokinase = 5069 U/L; troponin I >50000 pg/mm and potassium = 7 mEq/L [3.5–5.1]).

Transthoracic echocardiogram revealed no dilatation of the left ventricle, left ventricle inferior wall akinesia was observed, and ejection fraction was 50%. There was minimal pericardial effusion adjacent to the posterior wall. Chest x-ray showed no obvious pathology.

Electrocardiogram and echocardiography mimicked inferior MI. The patient was not treated with anti-aggregants because the myocardial necrosis was due to lightning strike. The patient was given intravenous fluid for acute kidney failure. In the following period, the patient developed respiratory insufficiency, was intubated, and was admitted to the intensive care unit. No MI-specific treatment was given to the patient, and he was followed



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Figure 1. Normal QTc Interval was Observed.

up regularly by monitorization, ECG, and echocardiography for MI complications like arrhythmia, atrial septal defect, ventricular septal defect, and ventricular perforation. However, no myocardial complications were seen. The patient developed multi-organ failure on follow-up and he was dead 20 hours after admission to the hospital.

Discussion

Some of the most hazardous complications of lightning strike are those related to the cardiovascular system. Those complications can range from benign ECG changes to severe complications, and even death.³ Latent myocardial dysfunction after lightning injury may be more frequent than suspected in routine clinical assessment.⁴ This case met the criteria of a ST elevated MI due to lightning, which is a very uncommon phenomenon. The pathogenesis of MI caused by lightning is important because treatment changes with the etiology. Various mechanisms have been asserted to explain the cardiovascular effects of lightning injury. These are catecholamine-mediated effects, coronary artery spasm, ischemia secondary to arrhythmia, direct thermal damage, and coronary artery ischemia.⁵ Previous studies have indicated that atherosclerotic processes do not play a role in MI caused by lightning.⁶ There is no vasoconstriction and thromboembolic coronary occlusion, so classic acute coronary syndrome treatment which includes anti-aggregants, anti-coagulants, statins, percutaneous coronary intervention, or thrombolytic agents are not needed. Victims die due to MI complications like arrhythmia and ventricular free-wall rupture. Also, atrial arrhythmias, atrial

fibrillation, and ventricular arrhythmias are most common in patients with lightning strike.⁷ In our case, we monitored our patient and performed daily echocardiography. We didn't perform coronary angiography (CAG) because previous publications stated that the electric current of the lightning was the cause of the myocardial injury, and the patient was 21 years old with no previous systemic disease or family history. No post-MI complication was observed in our patient. The cause of death was multiple organ failure.

Limitations of the Report

One major limitation of this report was that we did not perform CAG to the patient. Previous publications indicated that atherosclerotic processes don't play a role in MI caused by lightning strike. Our patient was 21 years old with no previous diseases or family history. But this does not mean, by chance, this patient may have MI and lightning strike at the same time. It would be better to exclude coronary artery disease by performing CAG, but because of the facts stated above and death of the patient at the 20th hour, we could not perform CAG.

Conclusion

Lightning strike is a natural phenomenon with dramatic complications, even though it is a rare event. Cardiac problems may be seen in victims who are struck by lightning. Various arrhythmias, MI, or MI-related complications may be seen. So, these patients must be evaluated with a detailed physical examination, ECG, cardiac markers, echocardiography, and monitorization.

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