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Acute Myocardial Infarction in a 17-Year-Old Boy Secondary to Lightning Strike

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ABSTRACT

Although lightning is an uncommon phenomenon in nature; it can cause many destructive incidents. In the event of a lightning strike, multiple organs particularly the cardiovascular systems are at risk of injury. Short-term mortality depends on its cardiac effects. In this paper, the authors report the development of myocardial infarction and pericardial effusion after lightning injury, a typical example of "side splash".

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Introduction

Lightning is an uncommon phenomenon in nature and it can causes death in affected patient. Extents of lightning strike injuries depend on the direction of current, the site of entry, position, and grounding of the patient. There are several mechanisms of lightning injury including direct strike, contact side flash, "splash", ground current, or blunt trauma. The most severe is a direct strike, either on the victim or on some objects the victim is holding such as an umbrella. Blunt injury and trauma may occur due to the shockwave from a lightning strike or as a result of falling down. A "side flash" occurs when lightning hits a nearby object and jumps to the victim. In this paper we report a case of acute myocardial infarction after lightning injury(1).

Case presentation

A 17- year- old boy was injured by the side splash of the lightning that struck the nearby electric power pole while walking in an open field in rain.

According to the witnesses, he was falling to the ground and immediately rendered unconscious. On arrival in the emergency medical services (EMS) at the scene (4 minutes after loss of consciousness), the patient was pulse- less, stopped breathing, and the patient's rhythm was asystole. Cardiopulmonary Resuscitation (CPR) was initiated by the EMS. The patient transported to Neyshabur general hospital after 5 minutes. On the initial examination in our hospital, he was intubated, Glasgow coma scale (GCS) was 5 out of 10(5/10-T) and his pupils were mydriatic. Systolic blood pressure on admission was 80 mmHg, and pulse rate was 90 beats per minute. Skin physical examination revealed first degree burns of his supra sternal and epigastric region. Jugular vein was flat and cardiac auscultation was normal. There were no rales. 12- leads Electrocardiography (ECG) on hospital admission revealed sinus rhythm with ST elevation in leads

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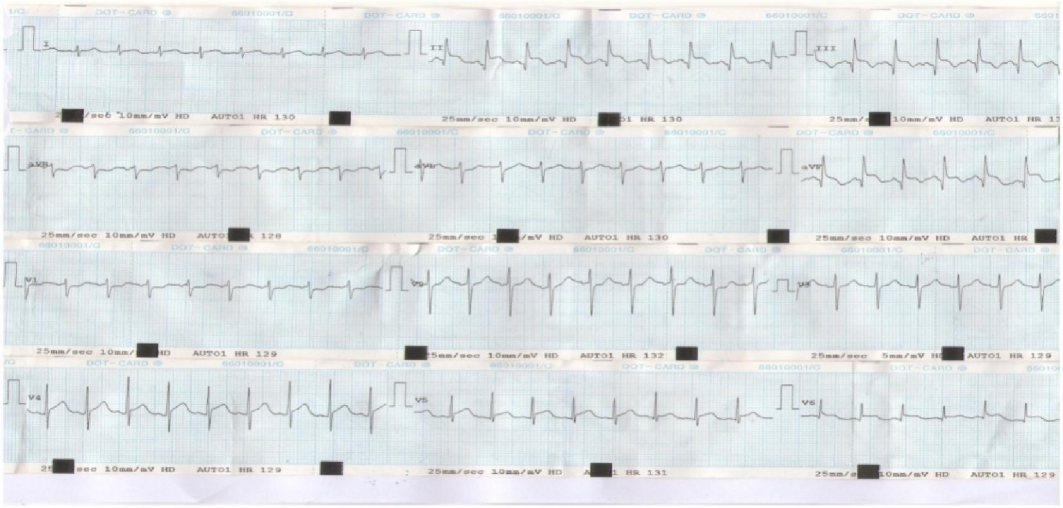

Figure 1. ECG revealed ST elevation in inferolateral leads suggesting acute inferolateral.

II, III, aVF,V5,V6 and ST depression in leads V1 to V3, which were suggestive of inferolateral myocardial infarction (Figure 1).

The patient was transferred to the Intensive Care Unit. Initial laboratory findings demonstrated considerable elevation in serum-troponin-I and serum-creatine-phosphokinase (CPK).CPK level was 678 U/l at fist day and reached to 1830 U/l at 2th day. Serum lactate dehydrogenase (LDH), amylase and standard liver panel test were also mildly elevated. Serum electrolytes were normal. Echocardiogram on first day showed severe hypokinesia of infero-lateral wall of left ventricle and mild circumferential pericardial effusion with right atrial collapse and no other signs of echocardiographic tamponade .Estimated left ventricle ejection fraction was about 40%.Computed Tomographic Image of the head revealed mild brain edema. Our therapies included heparin, manitol and IV hydration. Over two days after admission GCS fell progressively to 3.Furthermore repeated echocardiography and electrocardiography showed no significant changes. Serial total CPK and troponin level fell progressively during hospitalization. In the course of four days, there was no improvement in clinical and echocardiographical findings. Finally on the 4th day of hospitalization, he developed cardiac arrest with progressive bradycardia and CPR was unsuccessful for him. Myocardial necrosis and brain edema has been demonstrated at necropsy.

Discussion

Lightning strike is a rare natural phenomenon, which can almost always involve any organ. The most important organs that have been involved are heart and central nervous system. According to our patient, in other case reports the mortality rate of lightning is high and the majority of deaths are due to an immediate cardiac arrest (1 2) Participants in some kinds of sports workers on the farms or on construction sites are at high risk for lightning(3), our patient is also a farmer and was working near an electric power pole in a farm.

Cardiac involvement has various presentations. Arrhythmia can be induced by lightning ventricular fibrillation may occur with an indirect lightning strike to an object or the ground near the person, whereas asystole may be a result of the direct current through the individual. Atrial fibrillation also has been reported after lightning strike (4-6). Other effect of lightning strike on heart such as our patient is acute myocardial infarction, with spastic mechanism or thermal injury. Another issue is pericardial effusion that was presented in our patient as well, but revolution to tamponade was rare(1, 4-6).

Central nervous system involvement was reported during lightning strike. Paraplegia, intra cranial hemorrhage, loss of consciousness, difficulty in short term memory and seizure can occur after lightning injuries. Our patient also had brain edema and we don't know the exact mechanism of it; hypoxic encephalopathy may be the probable cause.

Skin injuries are also common. Most of the patients have first or second degree burns according to our patient but third degree or full thickness burns are uncommon. Poor prognostic indicators of the lighting strike injuries are cardiopulmonary arrest (76% mortality), for instant our patient who died due to cardiac arrest, cranial burns (37% mortality) and leg burns (30%mortality)(1, 2). Other effect of lightning is muscle contusion and bone fracture(1, 2, 7).

Conclusion

Strike by lightning is a sudden and unpredictable disaster with high mortality and morbidity. Until recently, there were little things that could have been done to minimize this risk. Lightning safety should be practiced by everyone during thunderstorm. Recommendations include: avoid metal objects and water, get off the high ground, avoid solitary trees, stay off telephone, get indoors or in a car(8). After the lightning injuries occur, the best managements depends on the organ involvement and it varies patient to patient.

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Conflict of interests

The authors have no conflict of interests

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