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DELAYED ONSET OF ATRIAL FIBRILLATION AND VENTRICULAR TACHYCARDIA AFTER AN AUTOMOBILE LIGHTNING STRIKE

Dorian Drigalla, MD, FACEP, Shannon E. Essler, MD, and C. Keith Stone, MD, FACEP

Department of Emergency Medicine, Texas A&M University College of Medicine, Scott & White Medical Center-Temple, Temple, Texas
Reprint Address: Dorian Drigalla, MD, FACEP, Department of Emergency Medicine, Texas A&M University College of Medicine, Scott & White Medical Center-Temple, 2401 S. 31st Street, Temple, TX 76508

□ **Abstract—Background: Lightning strike is a rare medical emergency. The primary cause of death in lightning strike victims is immediate cardiac arrest. The mortality rate from lightning exposure can be as high as 30%, with up to 70% of patients left with significant morbidity. Case Report: An 86-year-old male was struck by lightning while driving his vehicle and crashed. On initial emergency medical services evaluation, he was asymptomatic with normal vital signs. During his transport, he lost consciousness several times and was found to be in atrial fibrillation with intermittent runs of ventricular tachycardia during the unconscious periods. In the emergency department, atrial fibrillation persisted and he experienced additional episodes of ventricular tachycardia. He was treated with i.v. amiodarone and admitted to cardiovascular intensive care unit, where he converted to a normal sinus rhythm on the amiodarone drip. He was discharged home without rhythm-control medications and did not have further episodes of dysrhythmias on follow-up visits. Why Should an Emergency Physician Be Aware of This?: Lightning strikes are one of the most common injuries suffered from natural phenomenon, and short-term mortality ordinarily depends on the cardiac effects. This case demonstrates that the cardiac effects can be multiple, delayed, and recurrent, which compels the emergency physician to be vigilant in the initial evaluation and ongoing observation of patients with lightning injuries.** © **2017 Elsevier Inc. All rights reserved.**

□ **Keywords—lightning strike; atrial fibrillation; ventricular tachycardia**

INTRODUCTION

Lightning is the second leading cause of weather-related deaths in much of the world, second only to flash floods (1). Lightning delivers an instantaneous massive direct current that counter-shocks and depolarizes the entire myocardium, more often causing immediate asystole than ventricular fibrillation (2). It is the brief one-thousandth of a second shock that allows many patients to recover from lightning-associated cardiac arrest. Other cardiac dysrhythmias in lightning injury include atrial dysrhythmias, specifically atrial fibrillation (AF) and ventricular dysrhythmias (3,4). However, published reports of AF are extremely rare (5,6). We report a case involving delayed onset of AF with rapid ventricular response along with multiple episodes of unsustained monomorphic ventricular tachycardia (VT) that was induced by a lightning strike while driving in a patient without previous cardiac history.

CASE REPORT

An 86-year-old male with a history of hypertension and hyperlipidemia, and without known cardiac disease or dysrhythmias, presented to the emergency department (ED) by emergency medical services (EMS) 70 min after a motor vehicle accident. The patient reported that he was driving when a lightning bolt struck his vehicle. The car

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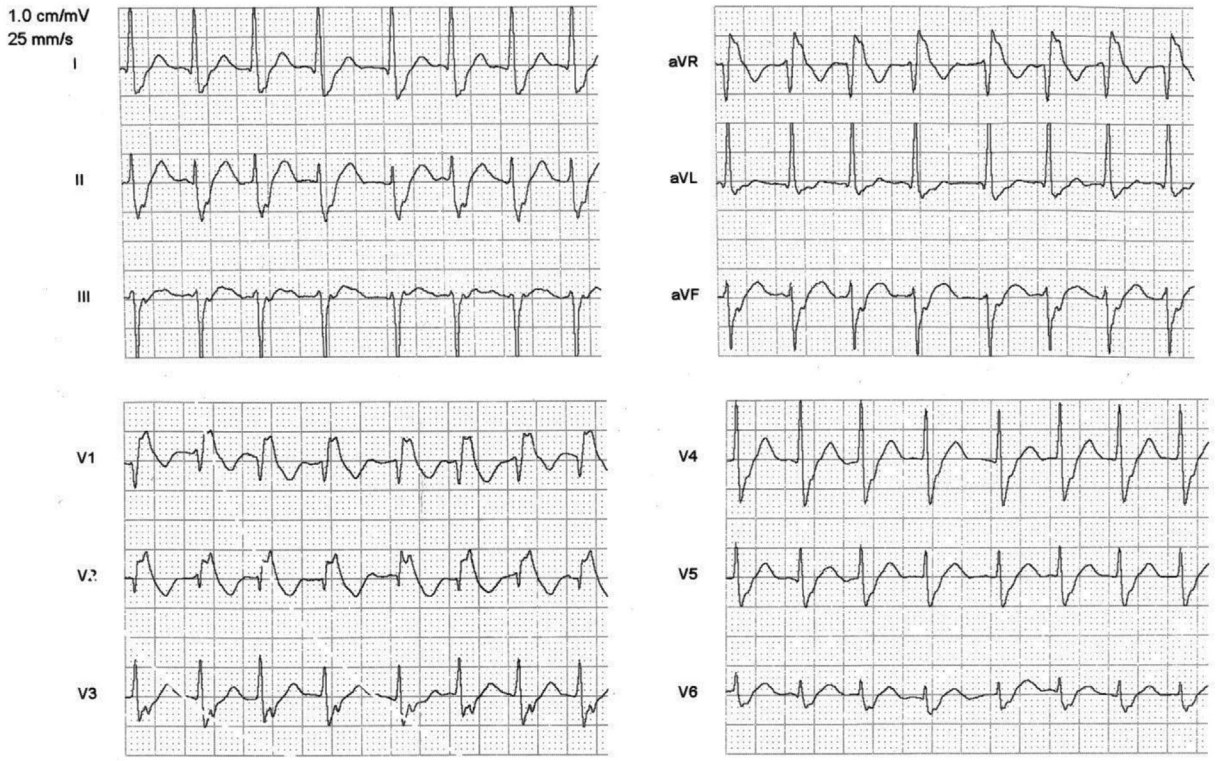

Figure 1. Emergency medical services electrocardiogram demonstrates atrial fibrillation with rapid ventricular response.

began to fill with smoke, which caused him to lose control of the vehicle and spin into a light pole and fence. The patient was restrained and airbags deployed. He denied loss of consciousness and was asymptomatic after the accident. EMS arrived to the scene 23 min after dispatch. His initial vital signs were blood pressure (BP) 189/69 mm Hg, pulse 62 beats/min, respiratory rate 18 breaths/min, and O_2 saturation 98%. Before the transport began, the patient was noted to have a brief episode of syncope. Upon regaining consciousness, he continued to be complaint free and reported that he had been "a little dizzy prior to passing out." He was placed on the cardiac monitor. A 12-lead electrocardiogram (ECG) was interpreted by the computer as AF with rapid ventricular response with aberrant conduction, right bundle branch block, and left anterior fascicular block (Figure 1). Repeat vital signs showed BP 134/82 mm Hg and pulse of 139 beats/min. During transport, i.v. access was established and he was placed on oxygen via nasal cannula. The defibrillator pads were placed on the patient and he was monitored. The patient had 2 episodes of VT lasting approximately 5−7 s (Figure 2). During each episode, he became unresponsive but continued to breathe normally and maintain a pulse. The EMS scene time and transport time totaled 47 min.

On arrival to the ED the patient was alert, oriented, and slightly diaphoretic. Vital signs showed BP 118/70 mm Hg, pulse 119 beats/min, and O_2 saturation 97%. Cardiac examination was unremarkable, except for tachycardia and an irregularly irregular pulse, and his neurologic examination was unremarkable. ECG obtained in the ED showed AF with rapid ventricular response, at 136 beats/min, with a premature ventricular complex, left axis deviation and right bundle branch block (Figure 3).

The patient experienced runs of VT within minutes of arrival to the ED without any alteration in consciousness, although he complained of "feeling weird" during these episodes (Figure 4). Amiodarone 150 mg i.v. bolus was administered, followed by drip of 1 mg/min. The episodes of VT continued but became markedly less frequent and symptomatic. Repeat ECG demonstrated AF with controlled ventricular response, at 91 beats/min (Figure 5) and was otherwise similar to his initial ECG. Vital signs remained unchanged throughout his ED stay.

A bedside FAST (focused assessment with sonography in trauma) ultrasound was negative for free fluid in the abdomen and pericardial effusion was not appreciated. A CT scan of the head did not reveal acute intracranial abnormalities and a chest x-ray study was negative for traumatic injury. Laboratory results demonstrated a normal complete blood count and a normal metabolic panel, with the exception of a glucose of 108 mg/dL, CO_2 22 mEq/L, and aspartate aminotransferase 55 U/L. Troponin I was normal. Serum magnesium was slightly