Case Report

Electrical storm with coronary vasospasm: reversal of the storm with intravenous large doses of diltiazem

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Abstract: The episode of ventricular tachycardia (VT) or ventricular fibrillation (VF) following coronary vasospasm is not an uncommon, but it occurring as a storm in the setting of coronary artery spasm is rare and effective management of the electrical storm still poses a significant challenge. We describe the case of a 58-year-old male who had a recurrent ventricular tachycardia/fibrillation and was defibrillated approximately 30 times unexpectedly often. Emergency coronary angiography revealed the entire right coronary artery systems diffuse spasm. The reason of the electrical storm was ischemia due to coronary artery spasm. Therefore, when electrical storm with episodes of ventricular arrhythmias was happened again, intravenous diltiazem 20 mg was administered as a resort therapy and the refractory electrical storm finally were controlled effectively.

Keywords: Coronary artery spasm, ventricular arrhythmias, electrical storm, diltiazem

Introduction

Electrical storm is an emergency situation with rapidly recurrent ventricular tachycardia or ventricular fibrillation and often need immediately to electrically terminate the hemodynamically destabilizing ventricular arrhythmias. However, refractory ventricular electrical storm is not always be effective under control by defibrillation and often requires antiarrhythmic drugs therapy to facilitate defibrillation. Beta-adrenergic blocking medicines may be helpful to prevent storm recurrence. However, administration of these medicines in electrical storm situations resulting from coronary artery spasm should be avoided because of their potential to exacerbate coronary artery vasospasm through unopposed α-adrenergic vasoconstriction [1].

Here, we report a case with electrical storm secondary to right coronary artery diffuse spasm which did not respond to conservative treatment, but successfully terminated with intravenous large doses of diltiazem.

Case report

A 58-year-old male with no significant past history was brought to our hospital with intermittent chest pain. On arrival in the emergency department, the patient had a sudden loss of consciousness. Manual chest compression was performed immediately and at that time, his electrography monitoring showed a ventricular fibrillation. Initial cardiac defibrillation successfully terminated the ventricular fibrillation, but shortly thereafter, he developed frequent episodes of ventricular fibrillation, which required repetitive cardiac defibrillations, continuous chest compressions, tracheal intubation and intra-aortic balloon pump support. Intravenous injection of β blocker, lidocaine, amiodarone were administrated and repeated defibrillations were attempted more than 30 times in the following forty minutes. Ultimately, the refractory ventricular electrical storm was finally terminated by electric cardioversion with intravenous administration of amiodarone and a repeated electrocardiogram (ECG) revealed third degree atrioventricular block with inferior ST elevation. We performed an emergency coronary angiography which showed the entire right coronary artery diffuse spasm, while the left coronary artery appear normal. Reversal of the vasospasm was achieved with intracoronary boluses of nitroglycerin. The patient was subsequently started on intravenous administration of nitrates.
Electrical storm with coronary vasospasm

The next morning at 6 am, the patient experienced recurrent ventricular fibrillation. Diltiazem 20 mg was administrated as a rapid intravenous bolus to reversal of vasospasm and a cardiac defibrillation effectively terminated the ventricular fibrillation. After that he maintained sinus rhythm during the infusion of intravenous diltiazem. On the third day, he was extubated and IABP was also weaned off on the same day. He recovered with no more complications and was managed on oral long-acting diltiazem. The patient finally was discharged on the 7th day. He had no symptoms with close following up for 6 months.

Discussion

Electrical storm is a syndrome characterized by recurrent ventricular tachyarrhythmias and it can cause by ongoing or recent myocardial ischemia, exacerbating heart failure, electrolyte disturbances, and so on. Coronary artery spasm was believed to be due to vasospasm in coronary arteries without significant fixed lesions. It is an important cause of chest pain syndromes with transient ST-segment elevation due to sudden, intense vasoconstriction of an epicardial coronary artery resulting in occlusion or near occlusion of the vessel [2]. Due to it associated with myocardial ischemia, coronary vasospasm can trigger acute myocardial infarction, severe arrhythmias, cardiogenic shock and even cardiac death [3, 4]. Previous studies had demonstrated that diffuse coronary artery spasm was associated with an increased risk of ventricular arrhythmias [5, 6]. Diffuse type coronary vasospasm had an important role in the pathogenesis of spasm induced myocardial infarction, intractable spasm refractory to conventional treatments and cardiac arrest [7].

Management of electrical storm resulting from coronary vasospasm still poses a significant challenge. Especially in the case that we do not know the cause of electrical storm is due to coronary artery spasm in advance. In the setting of electrical storm, it often required repetitive cardiac defibrillations and intravenous administration of antiarrhythmic drugs therapy to terminate the ventricular arrhythmias. Due to
the sympathetic nervous system is thought to play a role in the genesis of ventricular arrhythmias [8]. Beta-adrenergic receptor blockers seem to be the agents of greatest clinical benefit to patients with ventricular electrical storm [9]. However, administration of these medicines in electrical storm situations resulting from coronary artery spasm may exacerbate vasospasm through unopposed α-adrenergic vasoconstriction and should be avoided [1].

In this present case, the electrical storm was difficult to treat with the standard defibrillations and antiarrhythmic drugs. Finally after emergency coronary angiography, we known the ventricular electrical storm was associated with coronary artery spasm. Therefore, when the episodes of ventricular arrhythmias were happened again, administration of intravenous diltiazem as a result the electrical storm terminated. These facts imply the administration of coronary vasodilator, such as intravenous large doses of diltiazem may be an effective therapy for reversal of electrical storm following coronary vasospasm when patients are refractory to the standard cardiopulmonary resuscitation.

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Disclosure of conflict of interest

None.

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References