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SCIENTIFIC LETTER

Phenytoin as treatment for bidirectional ventricular tachycardia in a patient with anterior myocardial infarction and digoxin toxicity

Fenitoína como tratamiento de taquicardia ventricular bidireccional en un paciente con infarto de miocardio anterior e intoxicación por digoxina

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Introduction

This clinical case presents a patient with acute myocardial infarction who developed multiple complications, including the presence of bidirectional ventricular tachycardia.

Case presentation

A 68-year-old male with a history of diabetes was brought to the emergency room after he suffered a witnessed cardiac arrest, he received immediate cardiopulmonary resuscitation for 5 min and returned to spontaneous circulation. Electrocardiogram on admission showed an extensive anterior myocardial infarction and a right bundle branch pattern. He was in cardiogenic shock, so an intra-aortic balloon pump was placed, and a primary percutaneous coronary intervention was performed in the anterior descending artery. Glycoprotein IIb/IIIa inhibitor was administered due to no-reflow phenomenon. Echocardiogram revealed biventricular dysfunction without mechanical complications. The patient was hemodynamically supported with vasopressors and inotropic drugs. Forty-eight hours after admission, he developed atrial fibrillation, intravenous digoxin was used with impregnation doses of 1.0 mg on the 1st day and 0.5 mg every 24 h afterward for rate control. He had moderate renal insufficiency, his creatinine was 1.8 mg/dL, glomerular filtration rate 37.8 mL/min/1.73 m^2, and serum potassium 3.7 mmol/l. After 72 h on digoxin, he developed bidirectional ventricular tachycardia without hemodynamic instability (Fig.1), digoxin level was 2 ng/mL. Due to this patient's risk factors for digoxin toxicity, which included renal insufficiency, serum potassium, and elevated digoxin level, the arrhythmia was considered secondary to digoxin toxicity. Since he was hemodynamic, stable intravenous phenytoin 250 mg in 5 min every 6 hours was administered, with successful resolution of the arrhythmia and restoration of sinus rhythm.

Discussion

Bidirectional ventricular tachycardia is a regular tachyarrhythmia originated in a ventricular focus with two different QRS morphologies alternating on a beat-to-beat basis. The rate is typically between 140 and 180 beats/min, with a frontal plane axis varying between –30° and 110°[1]. The surface electrocardiogram most often shows regular tachycardia with the right bundle branch block morphology and alternating QRS axis best seen in the inferior limb leads.

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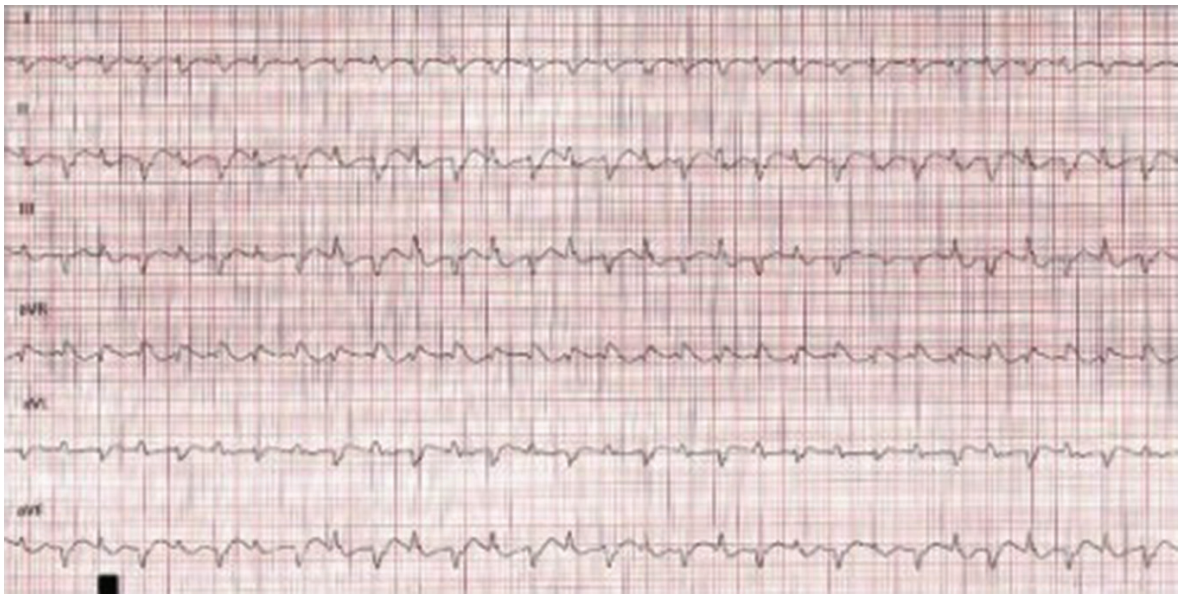

Figure 1. Electrocardiogram shows a tachyarrhythmia with two electrical axes.

Described causes of this rare type of ventricular tachycardia include acute myocardial ischemia, aconitine poisoning, catecholaminergic polymorphic ventricular tachycardia, digoxin toxicity, familial hypokalemic periodic paralysis, fatty replacement in the right ventricle, tumor of the ventricle, and myocarditis[2]. This patient had two identified factors that favored the development of arrhythmia: myocardial infarction and the administration of digoxin. This arrhythmia presented on the 5th day of hospitalization, so reperfusion arrhythmia was considered an unlikely cause. Moreover, this patient had elevated digoxin level and risk factors for digoxin toxicity. The administration of phenytoin was decided because digoxin-specific antibody (Fab) fragments were not available.

Phenytoin is a Class 1B antiarrhythmic that can be used in digoxin toxicity, it inhibits digitalis binding to the sodium-potassium-ATPase pump and antagonizes digitalis induced delayed after depolarization. Is an effective treatment for ventricular tachycardia in patients with multiple drug intolerances or symptomatic ventricular arrhythmia in digoxin toxicity[3]. Phenytoin has multiple drug interactions, possible side effects include vertigo, nystagmus, and lethargy. The effective dose is 5–15 mg/kg/day infusion with a targeted serum level of 10–18 mcg/mL[4]. A recent trial showed that cardiovascular adverse effects are uncommon with oral or intravenous infusion. The recommended of infusion rate is 10–25 mg/min in patients with a cardiovascular problem and 30–40 mg in patients without cardiovascular disease[5].

Conclusion

Bidirectional ventricular tachycardia is a rare and potentially fatal arrhythmia that can occurs in patients with digoxin toxicity or acute myocardial infarction. Digoxin-specific antibody is not usually available, but phenytoin is an effective and readily available treatment. Our patient responded well to the treatment without recurrence of the arrhythmia, he was eventually discharged without further complications.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the

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